U.S. NUCLEAR REGULATORY COMMISSION

SPENT FUEL TRANSPORTATION CASK TESTING PROTOCOLS

WORKSHOP

THURSDAY

MARCH 6, 2003

ROCKVILLE, MARYLAND

The Workshop met in the Auditorium at Two White Flint North, Rockville Pike, Rockville, Maryland, at 8:30 a.m., Chip Cameron, Facilitator, presiding.

PRESENT

CHIP CAMERON	Facilitator
CHET POSLUSNY	U.S. Nuclear Regulatory Commission
DAVID BENNETT	Tri State Motor Transit Company
BILL BRANCH	U.S. Nuclear Regulatory Commission, Spent Fuel Project Office

RICK BOYLE	U.S. Department Transportation, Office Of Hazardous Materials Safety, Research and Special Programs Administration
MICHAEL CASH	Alabama Department of Public Health, Environmental Monitoring and Emergency Plans
MICHAEL CONROY	U.S. Department of Energy, Office of Environmental Management, Office of Transportation
FRED DILGER	Clark County Nevada, Nuclear Waste Division
ROBERT FRONCZAK	American Association of Railways
LISA GUE	Public Citizen
ROBERT HALSTEAD	State of Nevada, Agency for Nuclear Projects
MARK HOLT	Library of Congress, Congressional Research Service

ABBY JOHNSON Eureka County, Nevada

KEVIN KAMPS	Nuclear Information and Resource Service
RAY MANLEY	Maryland department of the Environment, Air and Radiation Management Administration
ANDREW MURPHY	U.S. Nuclear Regulatory Commission, Office of Nuclear Regulatory Research
CHARLES PENNINGTON	NAC International
BILL SHERMAN	Vermont Department of Public Service
AMY SNYDER	U.S. Nuclear Regulatory Commission, Spent Fuel Project Office
ALAN SOLER	Holtec
KEN SORENSON	Sandia National Laboratories, Transportation Risk and Packaging Department
JOHN VINCENT	Nuclear Energy Institute
EDWARD L. WILDS, JR.	Connecticut Department of Environmental Protection,

	Division of Radiation
DAVID ZABRANSKY	U.S. Department of Energy, Radioactive Waste, Office of Transportation and Integration

A-G-E-N-D-A

P-R-O-C-E-E-D-I-N-G-S

8:45 a.m.

MR. CAMERON: If you could take your seats, we'll get started with today's program.

My name is Chip Cameron. I'm the Special Counsel for Public Liaison here at the Nuclear Regulatory Commission, the NRC. And I want to welcome you to our meeting this morning. And the topic for today is the NRC plan to conduct full scale testing of spent fuel transportation casks. And that plan is embodied in the package performance study test protocol, that I think everybody has a copy of.

I'm going to be serving as your facilitator for today's meeting. And I'm being assisted in my facilitation and convening responsibility by Mr. ChetPoslusny, whose right here, and he's from the spent fuel project office.

And our general responsibility as facilitators is to try to help all of you have a productive meeting today.

Before we get to the substance of the program, I just want to say a few things about the meeting process. And I'd like to talk about the purpose of the meeting, format and ground rules for the meeting and go over the agenda with you so you know what to expect today.

In terms of the purpose, the first purpose is to clearly explain the NRC plans for cask testing. Why is the NRC doing this, what is planned, how we are going to accomplish it.

The second purpose is to listen to all of your views and recommendations on those plans. The ultimate goal will be to use the commentary that we hear today and at the other public meeting and in the written comments, to use that commentary to assist us in finalizing the draft test protocol that you have in front of you.

The format today is a round table and, literally, you know it's know it's not round. But we have a group of what are usually called of stakeholders around the table, representatives of the broad spectrum of interests that are effected and concerned about spent fuel transportation. And we're fundamentally interested in each of your views. But the purpose of using a roundtable format is to engage in a discussion of those individual views by others around the table. So this will give the NRC and it will give all of us another perspective on the issues that we may not get in only reading individual written comments that come into us on these issues.

And I anticipate that our discussion will identify major issues of concern in regard to the draft test protocol. It will identify the extent of agreement on those particular issues. And also develop recommendations for moving forward with an effective test protocol program.

In terms of ground rules, the first one is I would ask all of you to be focused, concise and major in your comments today. The roundtable format has the benefit of giving us what I call a richness of views around the table in the discussion that comes out. But it also means that we may have to sacrifice a full description of your individual views on these important issues so that we can give everybody around the table an opportunity to talk today, and to make sure that we get through all of the items on the agenda.

So I'm asking you to try to keep your comments to major points. The written comment opportunity that the staff will be telling you about will give you an opportunity to fully explain whatever your comments are.

And, second ground rule, I would just ask you to give us a rational for any views that you have so that we can understand whatever point you're trying to make.

You have name tents in front of you. And if you want to talk, just put your name tent up like that, and that will spare you the burden of having your arm up all the time. And I will go to you for your comment.

I may take not take the cards in the order they're turned. We do want to follow discussion threads. In other words, we just don't want to hear the unrelated monologue that it's sometimes called. No negatives attached to monologue. But we want to hear a point from one of you and then we want to go to others around the table to see what they might have on that point.

We are taking a transcript today, and John is our stenographer over here. And I would ask you only one at a time speaking so that we can get a clean transcript and also so that we could give our full attention to whomever has the floor at the moment.

The focus of the discussion is at the table today. But, we realize that those of you in the audience also have important things to share with us. And we will going out to you in the audience for any comments, observations, questions that you might have out here. We'll do that once before lunch and once at the end of the day.

And when we do go out to the audience, I'll bring you this cordless microphone. And please give us your name and affiliation so that we have that for the transcript.

Okay. In terms of an agenda overview so that you know what's going to be happening. We're going to start out with what's called the regulatory and research framework. And we have three brief NRC presentations for you in terms of the NRC mission and responsibility, how we arrived at the cask testing decision and what we plan to do in the future. And then go out to all of you for questions and answers so that everybody's clear on what the backdrop is at this point.

The next session that's supposed to start at 9:15, and obviously we're running late, is called participant interest. And basically what we'd like to do is to give each of you an opportunity to make a short statement on your major interests, views and concerns so that at least once during the day you all have a chance to talk. And that will serve as useful backdrop for the rest of the discussion.

I also want to use that as an agenda building session for us. There may be items that we need to put in the parking lot to make sure that we cover those under the agenda items. I think the agenda items are pretty broad to cover a whole range of topics, but we may need to do some additions also.

9:45, overarching issues. We're going to have Dr. Andrew Murphy, who is right up here. And I will be introducing your speakers a little more fully in a minute, but Andy is right here. He's going to do what I call tee the subject up for you, and just tell you what the major issues are. And that's a participant discussion segment. It's not meant to be an NRC presentation, so we'll talk about those overarching issues. For example, what criteria are being used to develop the cask protocol, are they to be given equal weight. This may be an opportunity to talk about process issues in terms of what process the NRC uses to develop and implement the test protocols.

And then we're going to go for a break, for coffee and whatever. We're going to come back and we're going to talk about general testing issues. Again Andy Murphy is going to tee that up for us and you'll see some specific issues in the agenda and to start our discussion.

We'll go to lunch. And we're going to come back and we're going to start with impact testing issues at 1:15. And there's also some suggested questions on your agenda. They're issues that the NRC is interested in, but obviously we want to hear any other issues that you have on impact testing. And we'll also do a tee up on that one, again that will be Andy Murphy.

We'll break at 3:00, and then we're going to start on fire testing aspects of the protocol. And because it was a significant event of interest, we're going to start off the fire issues by having Chris

Bajwa from the NRC do a presentation for us on the NRC evaluation of the Baltimore fire. And then we'll go for questions and answers. And I know we have two participants here, Bob Halstead and Fred Dilger who have done a recent paper on the Baltimore fire issue, and I know they're going to be illuminating our discussion with some of their findings.

Amy Snyder is right here, who will tee up the fire test issues for us. We'll have a discussion of that, and then we'll have time for further issues.

We have a lot to cover. I just thank you all for taking the time to come down and be with us today, and hopefully it will be an informative and productive discussion for everybody.

A couple of administrative items. There are evaluation forms of the meeting on the desk back there. And if you could give us those or mail those in, we'd appreciate that.

There's also handouts, including the *Federal Register* notice that has all the contact information for submitting written comments, if you want to talk to someone about the issues. And there's also a sign up sheet.

With that, what I'd like to do is just make sure we all know each other before we get started. And let's start with Ray Manley here and then we'll proceed around. And we do have a carrier pigeon system to get across this large gap between Rick and Ed Wilds. All right.

Ray?

MR. MANLEY: Good morning. I'm Ray Manley from the Maryland Department of the Environment.

MR. PENNINGTON: Good morning. Charlie Pennington, NAC International.

MR. ZABRANSKY: David Zabransky, DOE office of Radioactive Waste, Office of Transportation and Integration.

MR. CONROY: Michael Conroy. I'm also with Department of Energy, with the Office of Environmental Management, the Office of Transportation.

MR. SHERMAN: I'm Bill Sherman. I'm with the Vermont Department of Service, and I'm representing the Northeast High Level of Radioactive Waste Transportation Task Force as well.

MR. BENNETT: I'm David Bennett with Tri

State Motor Transit Company representing the U.S. Transport Council.

MR. BOYLE: I'm Rick Boyle. I'm with the U.S. Department of Transportation and the Hazardous Materials Safety Group, that's the co-regulator of radioactive material and the competent authority for the United States. Thank you.

MR. CAMERON: Ed?

MR. WILDS: I'm Ed Wilds with the Connecticut Department of Environmental Protection, and also with the Northeast High Level of Radioactive Waste Management Task Force.

MR. FRONCZAK: Bob Fronczak. I'm with the Association of American Railroads. We represent the major freight railroads in the U.S., Canada and Mexico as well as AMTRAC.

DR. SOLER: Alan Soler from Holtec International.

MR. DILGER: Fred Dilger from Clark County Nevada.

MR. HALSTEAD: Bob Halstead, state of Nevada, Agency for Nuclear Projects.

MR. VINCENT: John Vincent with the

Nuclear Energy Institute.

MS. GUE: Lisa Gue with Public Citizen.

MS. JOHNSON: Abby Johnson with Eureka County, Nevada.

MR. SORENSON: Ken Sorenson, Sandia National Laboratories.

DR. MURPHY: Andrew Murphy with theNRC's Office of Research.

MR. LEWIS: I'm Robert Lewis with NRC's Spent Fuel Project Office.

MR. POSLUSNY: Chet Poslusny with Spent Fuel Project Office.

MR. BRACH: Bill Brach NRC Spent Fuel Project Office.

MS. SNYDER: Amy Snyder, NRC's Spent Fuel Project Office.

MR. CAMERON: Okay. Great. Thank you. I think you can see we have a wide and impressive range of expertise around the table today.

And what I'd like to do is to just get right into the context on this. And we have three short presentations that we're going run through and then go out to you for questions.

And let me introduce everyone who is going to be speaking now so that we can get that done in front.

And the first person that's going to be talking to us is Mr. William Brach, Bill Brach. And Bill is the Director of the Spent Fuel Project Office. He's in charge of all this. And Bill has spent over 30 years working for either the Atomic Energy Commission or the successor agency, the Nuclear Regulatory Commission. And I think he first started out back in 1971 as an inspector in the Oak Ridge Tennessee field office of what was then the Atomic Energy Commission. And since that time he's had a wide variety of management responsibilities at the NRC. Safeguards licensing issues, vendor inspection, reactor licensee performance evaluations, low level waste and decommissioning, medical and industrial use. And since 1999 the Director of the Spent Fuel Project Office.

So Bill's career spans most of the activities that we do. And we're going to be going to him for one second -- well, why don't we go to you now and then I'll introduce Any and Ken after you're done.

Go ahead, Bill.

MR. BRACH: Thank you, Chip. And good morning, everyone.

On behalf of NRC, I want also to welcome you to today's roundtable discussion and our workshop on the spent fuel transportation package performance study.

As Chip mentioned, I'm Director of the NRC Spent Fuel Project Office. And our office licenses and inspects interim storage of spent nuclear fuel and the transportation of radioactive material, including the transportation of spent fuel.

The NRC's principle and guiding mission to protecting public health and safety, common defense and security, and the environment guides our activities, especially with regard to our transportational spent nuclear fuel, as we'll be discussing today.

The NRC's primary role in transportation of spent fuel to a repository would be in the certification of the packages used for transport. The NRC, I believe, is well positioned to maintain its independent focus and role on maintaining safety in this arena.

The NRC staff believes that shipments of spent fuel in the U.S. are safe using the current regulations and programs. And this is an important point, and let me repeat this, and again I'll put that in the context of why I think it's so important as we'll be discussing the package performance study today. The NRC staff believe the shipments of spent fuel in U.S. are safe using the current regulations and programs. The package performance study that we'll be discussing today is focused on severe accident conditions, conditions which are markedly beyond the accident testing conditions and requirements as well as the experience that NRC has seen in transportation.

Our belief in the safety of transportation is based on: (1), NRC's confidence in the robustness of the shipping container that we certify as well as the ongoing research in transportation safety.

Also, as noted in the third bullet on the overhead, this confidence is based on industry's compliance with safety regulations and the conditions of the certificates which has resulted in an outstanding transportation safety record.

We've been studying the issue of transportation safety for more than 25 years. And we continually find that the likelihood of release from an accident and an associated risk to the public are extremely low. Even so, the NRC continues to be vigilant about transportation safety as an essential part of our mission.

The NRC follows an aggressive program to investigate and assess the continued safety of spent fuel shipments, including analyzing spent fuel transportation experience and the records to better understand safety issues, evaluating new transportation issues such as the potential for increased shipment levels, increased and changing cask contents, population along transportation routes and other factors, as well as using new technology such as enhanced modeling and analysis tools to estimate current and future levels of potential risk to the public.

The Package Performance Study, or PPS is an important part of NRC's confirmatory research program for spent fuel transport. The Office of Nuclear Regulatory Research has the NRC lead for the study, with assistance from the Spent Fuel Project Office for programmatic direction and also outreach activities. And we recognize that some stakeholders do not share NRC's confidence in its regulatory programs. We believe that the Package Performance Study can be an appropriate means for others to understand and to hopefully gain and share our confidence.

The NRC routinely conducts studies to review the adequacy of its regulatory programs. For transportation regulations we've completed three major studies since the 1970s, the most recently being completed in year 2000. Our current major effort is the Package Performance Study.

In March 2000 NRC published a report entitled *Re-Examination of Spent Fuel Shipment Risk Estimates*, more commonly referred to NUREG-6672. This study focused on risks of a modern spent fuel transport campaign from reactor sites to possible interim storage sites and/or permanent geological repository. The study was initiated in 1996.

At that time the NRC recognized a significant increase in the number of spent fuel transports is likely during the next few decades, and these transports will be made to facilities along routes and using casks not previously examined in past studies. And the risk associated with these transports can be better estimated using new data and improved methods of analyses.

This study, NUREG-6672, also concluded that accident risks were much less than those estimated in earlier studies.

In 1999 the NRC initiated the Spent Fuel Transportation Package Performance Study. This study examines the performance of spent fuel transportation casks in severe accident conditions. This study is expected to take 5 to 6 years. The study is being developed by NRC staff to confirm the reliance of analytical techniques to predict cask performance in accident conditions. The study is also being developed to demonstrate to the public and to the stakeholders the robustness of the NRC's certified transportation casks.

The study, as Chip has mentioned, is using a public participatory process or approach to obtain public and stakeholder input on the plans for and conduct of the study.

I want to provide just a very brief overview of the PPS from its inception leading up to our meeting today.

PPS began with a series of public meetings to collect views on possible future work on shipments of spent fuel and to identify possible follow on work to NUREG-6672, the report we issued in March of 2000.

In 1999 we held the first series of our public workshops and meetings. After the first set of workshops and meetings, NRC, we published what we referred to as the Issues Report in June of 2000. This report compiled stakeholder input obtained from the four previous meetings in 1999 and letters and email comments we received. Commenting stakeholders included nuclear industry groups, transportation industry groups, Departments of Energy, Departments of Transportation, state, local and tribal governments, public interest groups as well as general members of the public.

Then to discuss whether the Issues Report accurately captured the comments and suggestions, and to discuss recommendations to address them or to resolve these issues and comments, four additional public workshops and meetings were held in the year 2000. After these meetings, NRC took the Issues Report, the recommendations and comments and began an extensive planning phase for the Package Performance Study.

The first major product of this latter phase of the Package Performance Study is the topic of today's meeting, that is to present the drafttest protocols and receive your comments, your views and your recommendations.

Now if you will, what do I see as a success for today's meeting? The PPS draft test protocol report, NUREG-1768, summarizes the field tests that NRC proposes to perform under the Package Performance Study as well as the analyses performed to develop the test summaries.

The test we propose involve previously NRC certified designs and are not directed to and are not related to NRC certification of any specific cask design.

We've issued the report, NUREG-1768 the draft test protocols for a 90 day public comment period, which ends May 30. The report and comment period were announced via *Federal Register* notice, dated February 21st of this year, along with meeting notices, a press release, a mass mailing of over 500 copies of the PPS draft test protocol to those on our mailing list, and as well the report is available on the PPS website.

I would offer if you are not on the mailing list and you wish to do, please see NRC staff at the table outside of the auditorium.

Now the purpose of today's meeting is to obtain comment on these proposals. I want to emphasize that no decisions have been made yet. And I want to say that again, no decisions have been made yet on the test conditions, the test parameters or the test activities. And I'm looking very much forward to active discussion and input with regard to views and perspectives on the draft and recommendations for our consideration in the draft test protocol.

I'm happy to see such a large group of qualified participants, both at the roundtable and in the audience. And I'm confident and I'm hopeful that your comments will help us, NRC, develop the best and most appropriate test plan for the Package Performance Study.

And finally, let me note that we're also interested to hear from you if you find this meeting and its format useful and productive. As I've mentioned, this is the third series of public workshops and outreach meetings that we've had on the Package Performance Study. Chip has mentioned that meeting evaluation forms are available on the back table. I'd be interested if you have any comments, to please provide those to us. As well, perhaps, if you're providing written comments to us on the Package Performance Study following today's meeting, you can as well provide comments and views on the meeting and the conduct of the meeting in those comments as well.

With that, I thank you.

MR. CAMERON: Okay. Thank you very much, Bill.

And if you would all just bear with us

for a few more minutes, we'd like to get this whole thread of background out for you and then go out to you for questions.

Bill has given you the broad overview, and now we're going to go to Dr. Andy Murphy, who is right here. And he's from the Office of Nuclear Regulatory Research, and he's the Project Manager for the Package Performance Study, including the development of this test protocol.

And Andy's been with the NRC for approximately 24 years in the earth science seismic and structural engineering field. And his major projects at this point are overseeing the Package Performance Study, and he's also working on seismic hazard estimates for nuclear facility siting.

During his career here he's managed a number of large scale testing programs with nuclear power plant inspectors. It makes him very qualified to oversee this particular program.

Before he joined the NRC he was the research scientist at Columbia University's earth observatory. He has a bachelor's in geophysical engineering and graduate degrees in seismology and he's going to give you an introduction to the draft test protocol.

Andy?

DR. MURPHY: Good morning, as Chip has introduced me, I'm Andy Murphy with the Office of Research and the Project Manager for this program.

Listed on the first viewgraph are the staff members who have worked with me in producing the test protocol package that is available. When Ken Sorenson gets up here in a few moments, the co-authors on his paper are the folks from Sandia that have supported us tremendously in putting together this package. They have done the analysis and taking the details for us, and I'd like to indicate our appreciation of that.

First slide, please.

There we go, objectives. This morning's topics, the objectives of the Package Performance Study, and then our expectations, the staff's expectations of the outcome of this meeting. We'll also talk about the status of the Package Performance Study, and indicate very briefly what the staff's proposal are as far as the impact and thermal tests are concerned. And then we'll address some specific issued identified for comment.

Next. Here we take a look at the objectives of the program. The first is that we're interested in significantly working at enhancing the public confidence in the safety of these packages.

We also be looking at the validation of the analysis codes that are being used to predict the response of the packages in severe or extreme accident conditions.

I guess I'll tell you what do we mean by this. Very specifically, the contractor, our contractor Sandia, after we have developed the detailed test plans, they'll be making predictions of the behavior of the casks in both the impact and the thermal testing. And we will publish those, make those publicly available along with criteria to indicate what we think would be a successful prediction. Those predictions will be published beforehand and will be available for the public to take a look at it to see how well we did when the tests were accomplished.

As far as actually carrying out the

tests, we anticipate and plan to have those opened to the public. We are planning on having a seminar or workshop, an instructional period or meeting before them to explain what's going to be happening in the test. And then the day of the tests we will have the folks, the public available to actually view the tests.

So that in the particular case of the impact tests, we will predict a ding or a dent for the cask. After the test is completed, you'll be able to go up and look at the cask and say "Okay, fine. They predicted this size dent in it and we predicted that it would be here, and it is there or it isn't there."

The entire forum will be open so that there will be no question about what we have predicted and what has happened.

The next bullet on there is to obtain data for refining the risk estimates that we have been making, such as was done in 6672. We're providing actual physical data to refine those estimates.

The next bullet up there indicates that we'll looking for a level of acceptance of the realism that is used in the tests. We could carry out in principle, carry out the tests and instead of dropping it from some 275 feet or so to obtain the 75 miles an hour, we could be dropping it from 500 feet or 600 feet to see this thing bounce all over the place. But our intent is to carry out an experiment that has some realism associated with it.

What are our expectations for today's meeting? As Bill has indicated earlier, we are here to get comment. We have put together a test program by way of a proposal and I think everybody here has probably figured out that if we're actually using real casks, this is going to be an expensive experiment and there'll be little chance of repeating this experiment. So that when we do carry it out, we want to get the tests parameters right so that we're doing the appropriate challenges to the codes and the activities to work on improving public confidence.

The next slide, please.

The status. The first thing you should know is that what we are talking about today by way of the test protocols for the Package Performance Study are the draft experimental plans. This is what the staff thinks would be a good experiment, this is what we're proposing is a good experiment to challenge the casks and to accomplish the objectives.

The next bullet up there is the website on which the Package Performance Study test protocols are posted. They're also posted on the Sandia website. We give you this website in addition because on this site there is a pointer to a page at which you can leave your comments. Fill it in looking at the document, you can read it on one part of the site, go to another part and leave your comments.

The Package Performance Study's test protocols are out for a 90 day comment period that ends the 30th of May. To tell you what's going to happen there, in the past we had issued comment resolution documents based upon the comments that we received. We do not have a plan at this time to issue a formal public comment resolution document. What we do plan on doing is that as we modify the test plans, we'll indicate in the test plans the reasons for the modifications that came from the draft test plans.

After we have received the comments, the comment period is ended, the staff in Sandia will develop the detailed test plans. This will be the plans that we will follow in carrying out the experiment. These will be issued to the public, not by way of comment, but if folks do have comments or thoughts on them, we would be receptive to receiving those additional comments. But this is not a document that is formally being issued for comment.

The sub-bullet indicates that this is the point where we'll be making decisions. We have made decisions at this stage as far as what we're going to propose. But as Bill indicated, these are not final in any sense. It is not until we have the public comments in that we're going to work on making the final decisions, the final recommendations as to what this test program is going to be all about.

Next one.

To carry out the calculations and analysis that we needed to do to put together these test protocols, the staff had to make some decisions about the two cask types that we're going to look at the rail and the truck ones. We selected the Holtec cask based upon a couple of criteria, the first two of which were that it would be a certified cask and that there would be some likelihood that these casks would actually be used.

I'll put in the caveat right now that in no sense in making these two selections for the Holtec, for the GA-4 cask is this any kind of commercial recommendation of these two casks.

The staff proposes to carry out these experiments using full sized casks, actual casks manufactured by the vendors. They're proposing to do a vertical impact from a tower. The orientation of the casks that we're proposing at this stage, and this is where the prop comes in, will be at a slight angle, center of gravity over the corner. Hopefully the can's empty. We'll be hitting it on the lid end, which will be the more challenging both for the analysis and for the cask itself.

The impact speed that we have proposed at this stage is a 75 mile an hour impact, which is a drop from 275 feet give or take a little bit onto an unyielding surface. And we have selected the unyielding surface for a number of reasons, the technical reason being that it takes the target out of the analysis equation. If we allowed it to impact on some sort of a soil site or a soil target, or a yielding target, we would then be having to carry out the same kinds of challenging analysis for the target. This way with the unyielding target, we force all of the kinetic energy in the drop into the cask. Okay. This has the effect of increasing the apparent speed with which this object hits the ground.

Dropping this on this package onto an unyielding target has the effect of at least doubling the impact speed so that we're talking about 100 -- basically 150 mile an hour drop onto some sort of a yielding target.

The package, the Holtec package can hold 24 fuel assemblies. We are proposing to take one of those fuel assemblies to be very similar to or identical to an actual fuel assembly, except we will not be using a radioactive materials in that experiment. We're carrying these out so that we are able to affix transducers to these objects and to get values of the stresses and the strains that are occurring the fuel assembly.

The Holtec, the other 23 assemblies will be dummy assemblies. Different from the surrogate, in that they're basically -- they'll mimic the weight and the density of the assemblies.

The next one.

Okay. This is a very simple sketch of what the Holtec Hi Star 100 Rail Cask looks like. It shows the basic features of the multilayer sidewalls, the lid. On the upper right hand side you see the multipurpose canister being inserted as well.

The next one, please.

This is a very nice picture of theHoltec cask mounted on a rail car. Give you a good idea of the size of this package. The extra trucks on this thing will give you an idea of the impact of the weight. The cask weighs about 125 tons.

The next one, please.

Here we're talking about the proposal for the truck. We're proposing to use the General Atomic GA-4 Truck Cask. Again, we will be using an actual cask. We're again proposing to drop it from the tower. This is where the other props come in, the orientation. If this is the cask, if it's cylindrical -- no, excuse me. It's got a square cross section with the impact limiters on the end.

What we're proposing is what we call the back quaker drop, and that would be dropping a cask onto a cylindrical projection from the unyielding target. Again, un unyielding target and, in effect as you can see, backbreaking -- breaking the back of the cask.

Ken has a very nice sketch of that in his presentation, which he'll show you in a few moments.

Again, we're talking about a drop of 75 miles an hour unto an unyielding surface. This 75 mile an hour impact for both the truck and the rail casks was selected so that we would get into the plastic regime of the deformation. That the objects would be deformed and that we would be looking at the deformation in our analysis trying to pick that deformation out.

Again, the cask will have a surrogate fuel assembly, one and then three dummies in it.

The next slide, please.

And this is, again, a simple sketch of the General Atomic GA-4 Truck Cask showing the cross section and the various components, and the impact limiters at the ends.

Next, I'll talk to you for a few moments about the thermal testing. Very specifically the thermal testing will be carried out on the same casks that were used for the impact testing and, obviously, it will be the same -- do the other way. The sequence will be that the impact tests will have been conducted before we do the thermal tests.

The thermal tests, again, we will be testing both casks. We'll be using a fully engulfing optically dense hydrocarbon fire. What does that mean? That basically the fire will completely surround the package, that the fire will be intense enough so that you will not be able to see through it. And the hydrocarbon means that we'll be using something like jet fuel as the fuel.

We have proposed that the duration for the test will be in excess of one half hour. More than a half hour. Okay.

Next one.

We have identified in the test protocol package two different places in two different formats so that we could be explicit about what we are interested in so that there would be no question that there were a number of things that very specifically the staff was interested in getting comments on. I've got a number of them here on this slide, and they're very simple.

We've selected two cask designs. We would like to hear comment on whether two is the right number for the casks that we have selected. Actually, I should be using the word proposed. The casks and the number that we have proposed are listed there. We would like comment on those.

The orientation, we're going to drop it CG over a corner, center of gravity over a corner or we're going to do a back breaker? We're interested in comment.

The impact speed the staff has indicated in the Package Performance Study test protocols that the impact speed range that we had initially looked at was between 60 and 90 miles an hour. And the staff made a decision as described in appendix A of the test protocol report why we have selected the 75 miles an hour.

Those are decisions or proposals that the staff has put together. We're very definitely interested in comments on those.

Okay. I told you that we're going to be doing this with the actual casks. They'll be full sized, full scale. There have been a number of comments within the agency, anyway, as to whether or not the appropriateness of carrying out these with full scale or with subscale casks. We would like comment and thought on that as well.

I told you that we will be using one surrogate. It looks very much like a fuel assembly plus a number of dummies.

The duration that we have proposed for the thermal test is more than a half hour. And there's a question that Ken will touch on in a few moments about the position of the cask relative to the pool fire itself.

The important thing that we want to get out of this series of workshops here, Nevada and Chicago, is that we're interested in getting comment on what we have proposed. What we have written down is a proposal. As I indicated earlier, this is a rather expensive program. We're probably only going to get to do it once, and we need to get it right and we need the help from anyone and everyone to do that.

There are a number of issues in here that the decision -- there I go again. The proposal from the staff was based upon some of the comments that we have received. In particular when you take a look at the question about scale, and the issues report was very definitely a overwhelming set of comments that these should be done a full scale. That has definitely influenced our decision, and I think at this stage it's a good decision to do full scale testing.

Chip alluded to the fact that in a prior series of assignments it was involved in large scale testing programs for reactor components. And the vast majority of those we did them as scale models. And I can see very definitely the benefits here both for the validation purposes and for public confidence enhancement to carry these out at full scale.

A number of the decisions that were made were based upon the input, the folks from the public. And we're interested in carrying out that dialogue and continuing it to get as much information as we can, to get as many opinions about how to do this as we can so that we can make the right or the best decisions about how to proceed with this program.

Thank you.

MR. CAMERON: And thank you very much, Andy.

One more piece of context on this, and then we'll really turn the meeting to all of you around the table.

And Ken Sorenson is with us. And Ken is the Manager of Transportation Risk and Packaging at Sandia National Labs. He's there for 15 years working on transport of various issues, whether it's on computer analysis of cask response to various loading conditions, testing of casks, risk assessment. He's also the chair of the package and transport division of the Institute of Nuclear Materials Management. Bachelor's degree in civil engineering from University of Arizona. A master's in civil engineering from Colorado State and a MBA, University of Mexico.

And he's going to give us a little bit more detail about the draft protocol.

Ken?

MR. SORENSON: Thanks, Chip.

And good morning, everybody. Let me say we are glad to be here this morning. I think as Andy said, we consider your feedback very important and we look forward to getting your comments on the protocols.

We have one chance to do this test, and we want to get as broad as range as comments as we possibly can to make sure that all the considerations are taken into account.

Sandia is the support contractor for the NRC in the Package Performance Study. We've done the analysis that you see in the test protocols. I'd like to recognize the analysts who've actually done this work. They are Doug Ammerman, Bob Callan, Carlos Lopez and Jeremy Sprung.

Let me see, we have three here. Jeremy Sprung did not make it, but the other 3 are here. So if we have some very specific technical questions, they might be able to support something as well.

As a way of background for this short talk, what I'd like to do is bridge a time span from March of 2000 to today and show you how we got to where we are on the protocols. And it's important to note, I think, Bill Brach mentioned it and Andy as well, that there was a lot of public feedback comment that went into this process and it's really reflected in the test protocols. These early public meetings that we had really set some guideposts in the pathway for us, if you will, to really give us a direction on how to design the test protocols to a point where we could get it out again for public comment and get the feedback from you all.

When the reexamination of spent fuel shipment risk estimates came out in March of 2000, as Bill mentioned we had some public meetings on that to get feedback. And in addition to that, we had a second set of public meetings where once we had that feedback, we had what was called the issues report where we had assimilated the public comment and put it in a NRC document form so that we could go back to these public meetings and say "This is what we heard. Is it correct?" And we had this second set of public meetings in the summer of 2000.

There's lots of comments that we got from that process. Some of the general ones are shown here in general. Some of the main comments was you need to do a more refined job of your computer analysis.

For example, in 6672 we did a 1D finite

element analysis for the thermal part of it. For the structural part of it the finite element analysis around the closure area of the modeling was a little more coarse than it could have been. These issues were trade-offs that we used in the analysis due to resource and schedule constraint. So the comments coming back was well you really need to do a much more refined job of your analysis in these test conditions.

And then secondly, one of the overriding comments that we got back from these public comment periods was that you need to do some testing, just show us how these casks really do perform in a severe testing environment.

As a basis of that then, these public comments with the issues report, the NRC sponsored the Package Performance Study and we got the point of the test protocols that you see before you today.

The PPS work scope, the objectives as they've been defined, really are developed from recommendations during these public meetings and listed in the issues report. And there's five main recommendations that come out of this.

The first, as I've already mentioned, is perform 3-D computer analyses for severe or extreme mechanical loading environments.

The second one is to perform detailed 3-D thermal computer analyses on extreme thermal loading environments for the casks.

Number three, given those analyses, conduct high speed impact tests and also thermal tests for the casks.

What you see before you today is the test protocols, and these are test parameters based on the recommendations in the issues report that are proposed for the test. And, again, the point of these meetings is to solicit feedback on these proposals and address those comments as we get them to see if we need to change direction.

And then the final test parameters will be defined in the test procedures after the comment period and after we have a chance to simulate the comments and address the comments.

The fourth recommendation to come out of the issues reports was to conduct fuel tests experiments to see how the actual field bundles behaved in these severe or extreme mechanical loading environments.

And then the fifth one was to reconstruct the accident event trees that were used in 6672 that also came from the modal study back in 1987/88 and look at probability of distribution functions of accident speeds and also fire durations.

The argument was that the data that was used in those event trees is somewhat dated. There's lots of new data out there. The interstate highway speeds went from 55 to 70, 75 and so you could expect some changes in accident rate distributions and things like that.

Now, for the Package Performance Study points four and five are not covered. Four is on a different testing schedule and five is not a test sort of activity, and so that's not covered in the Package Performance Study. So what we are looking at in this document is the analyses of the severe loading environments and then also the test conditions.

So the objects, what we have in the test protocols is to identify candidate casks. Again, these are casks that are put forward in the protocols as a way to stimulate discussion in terms of what sort of casks we should be using and those sorts of things.

Describe the concepts for the impact and fire tests. And this is where some of these recommendations from the Issue Report come in terms of doing the computer analyses and doing the testing. So we use these computer analyses to present impact and fire test options.

And then, thirdly, the protocol's goal or objective is to use them to solicit public feedback and comment.

I'd like to show you just a couple of analysis pictures, just to stimulate your thinking, if you will, a little bit. This first one is the Holtec Hi Star Rail Cask, about 125 ton cask. It carries 24 PWR assemblies in a canister. This is right out of the protocols. It's what Andy described as the center of gravity over of corner impact at 75 miles per hour. And the plot on the right there is actually an acceleration plot versus time. And so this is how many Gs this package is seeing because of the drop. And, again, since this is a unyielding target, all the kinetic energy that has been developed through that drop goes into deformation of the impact limiter in the package. None of it goes into deformation of the target.

And you can see that this results in a G loading to the cask itself of about 100 Gs.

We did a 9 meter drop, regulatory type drop analysis for this particular design at 9 meters in this orientation. And that's the red horizontal line where it says regulatory test. And that resulted in a G loading for that cask design of about 30 Gs in that orientation.

So you can see the 100 Gs that's developed for this orientation and speed for this cask design is really a severe test relative to the regulatory requirements of the 9 meter drop.

The second cask that's in the protocols is the GA-4 Truck Cask. As Andy said, in the original public meetings that we had two and a half years ago, there was talk of doing one test, the rail cask test. After looking at the Issues Report and considering more NRC made the decision that really we should look at a truck cask as well. And we thought if we have a second drop test with the truck cask as opposed to rail casks, what are the opportunities we have here to learn something different. We just didn't want to repeat the same test that we'd done for the rail cask.

And, again, out of the Issues Report that came from the public comment, one of the comments that was very consistent during these meetings was what happens in an accident if the cask hits a target and bypasses the impact limiters? The impact limiters are not put in to play, what happens to the cask?

Well, here was an opportunity to look at that type of orientation or that type of an accident scenario for the second drop. And what you see here is what's called a back breaker test, and you can envision possibly an accident where a cask is involved, a truck cask is involved in an accident and maybe is wrapped around a bridge pillar or something like that, a bridge support where it would not actually engage impact limiters. And that's the intent of this type of drop orientation.

This is one is also done at 75 miles per hour. And you can see this results in a peek G loading on that cask of about 150 Gs, and an average G loading of about 100 Gs. And you can see you get really quite a lot of deformation of that cask in that particular orientation for this design.

This is a pretty busy picture, actually, of some of the thermal analyses that come out of the protocols. The casks show there is the Hi Star Rail Cask. It has a surface temperature plot, the big plot in the middle. And that is for the one meter height above the pool fire. But we show on the left hand side different locations relative to the pool.

The one on the bottom, of course, is if the cask is on the ground. The middle one is the regulatory height of one meter. And then the top one is if you have the cask, what we call above the fire dome. That's at 3 meters. Excuse me. The vapor dome.

The dark part right under the cask is called the vapor dome, and that's where you have incomplete combustion of the fuel/air mixture because there's not enough oxygen in there. So it's a relative cool area relative to the fire. And so we were doing some investigations to see how these different locations relative to the pool leveleffected the heat of the cask, the surface temperature of the cask. So there you can see what the plot looks like for the surface temperatures and then a temperature versus time plot of different specific points on the cask for that particular orientation and test condition.

The picture at the upper right hand corner is actually a 3-D plot of the fire condition. And one of the analysis tools that we use in the protocols, and we're using for this program, is called CAFE, which is a fire code that actually -- it's able to analyze the flux to the cask surface based on the fire conditions.

That's the technical part or a snapshot of the technical part of the protocols.

We also had a fair amount of technical review during the process between summer of 2000 and today in getting to this point.

We first introduced, if you will, the Package Performance Study at PATRAM 01 in Chicago in September. Rob Lewis gave a plenary talk on the Package Performance Study.

We had last April an expert internal expert review panel look at where we were on the test protocols. Actually we had two expert review panels; one was structural and one was thermal. And we got experts from academia and industry to review where we were. We had some international participation as well to review where we were and from the technical standpoint if what we were proposing made sense.

And then in June of 2002 we made a presentation to the NRC Advisory Committee on Nuclear Waste. And also in June we made a presentation to the National Academy of Sciences.

So up to this point this document has had a fair amount of technical review to it already.

Thank you.

MR. CAMERON: Okay. Thank you very much, Ken. And thank you all for bearing with us so that we could get all that information out. There was a lot of information, and we want to go out to you for questions. I realize those questions may be the leading edge of a comment, and I'll keep track of that so that we can factor that into the discussions.

Before we go to Bob Halstead, a couple of people have joined us since we began, and I just wanted to give them a chance to introducethemselves.

Rick Boyle, I believe came in. Rick, could you just tell us where you're from and what you do?

MR. BOYLE: Thank you, Chip. I'm with the U.S. Department of Transportation in the Research and Special Programs Administration. I head up the radioactive materials branch in the Office of Hazardous Material Safety. Simplistically it's the co-regulator with the NRC where they do the type B and the package designs. We do the communications and the administrative side. We serve as the competent authority representing the U.S. at IEA. Thank you.

MR. CAMERON: Okay. Thanks, Rick.

Kevin?

MR. KAMPS: Hi. My name is Kevin Kamps. I work at Nuclear Information and Resource Service here in Washington, D.C. And we are a public interest organization with members of the states, many ofwhom live along proposed nuclear waste transportation routes to the private fuel storage facility in Utah as well as the proposed Yucca Mountain repository in Nevada.

MR. CAMERON: Okay. Thanks, Kevin.

And Mark?

MR. HOLT: Hi. Mark Holt with Congressional Research Service. I'm an energy policy analyst primarily responsible for energy.

MR. CAMERON: Okay. Thank you very much, Mark.

Let's go to Bob Halstead for our first question. Bob?

MR. HALSTEAD: Yes, Chip, a comment, and probably the last easy question of the day. I'd add to the list of references that Ken had there the transcript of the November 19, 2002 Advisory Committee on Nuclear Waste meeting, the number of presentations by Doug, NRC staff and other contractors that supplement that June 2002 discussion.

And, hopefully the easy question for Ken or someone, is are the expert panel review meeting transcripts on the Sandia website yet or can they be made available as soon as possible?

MR. CAMERON: Ken?

MR. SORENSON: They're not on the website yet, but they could certainly be made available.

MR. HALSTEAD: Yes. That's real important to us.

MR. CAMERON: Okay. Thank you, Bob.

John Vincent?

MR. VINCENT: John Vincent, NEI.

I just had a point of clarification for Bill Brach. It's my understanding that what we're contemplating here is extra-regulatory testing and not severe accident testing. Severe accident testing is covered mostly, almost completely by the existing regulations. So I think it's very confusing to reference the fact that you're doing or calling extra-regulatory testing severe accident testing. Just a point of clarification. I thought that that was the way I understood the situation.

MR. CAMERON: And can we get a clarification on that? Bill?

MR. BRACH: John, your characterization is correct. Extra-regulatory testing is what we are considering in the draft test protocol and my earlier reference to severe accident was I'll say with lower case letters not meant to imply anything beyond. We are considering in the draft test protocols extra-regulatory testing, as you just mentioned.

MR. VINCENT: I just had two other very simple comments.

I heard referenced twice already this

morning the fact that 75 miles an hour equates to a 275 foot drop. That's not correct. 75 is 189 feet. 275 is the 90 mile an hour drop test. Just a point of clarification.

And secondarily, I'm going to put my PFS hat here for a brief time. A slide that was shown with the PFS cask, some of you may have noticed that it seems like the CG of the cask is awfully high above the bed of the transport trailer. There is an extra intervening support stand for the cask and the cask cradle for transport in that picture. So the cask CG would actually not as high as portrayed in that picture.

MR. CAMERON: Yes, thank you very much, John.

Let's go to Ray Manley and back over to Lisa.

MR. MANLEY: Ray Manley from Maryland.

I think I'm caught in a bit of a Catch 22 here. Generally the gentleman's comments across the table back in July of 2000, just had a theory on the Howard Street Tunnel about this afternoon.

He got a lot of concern from our

stakeholders in regard to that incident and I guess one of the things I'm here to take a look at is specific criteria that meet up with that accident in the Howard Tunnel. And I'm not going to make any recommendations at this time, but I just have some very general comments of things that I don't necessarily see in the testing protocol, and that is perhaps a clear definition of accident, minimum temperatures that can read this thermal test with regard to measuring those criteria. When you're doing the test, I don't see specific pass/fail criteria for any.

I know the purpose of this is how it compares against the modeling, but when it's a test, when it fails, what does that mean? How far away from that model do you have to be for that test to fail?

And I guess I'm just concerned. I think it's said that the current regulatory criteria meets 99 percent of transportation accidents. But I'm still a little unclear whether the Howard Street incident meets that one percent or is not represented by that regulation.

And I guess just a final comment. I know it would probably be, and I'm not an engineer in possible cask failure. These tests should provide a better estimate and analysis of that failure. ??

Thank you.

MR. CAMERON: Okay. And, Ray, we are going to address those specifically when we get to those issues, including the relationship between the Baltimore tunnel fire and the test protocol. So thank you for raising those, and we will get to those specific questions.

Lisa?

MS. GUE: I had a question coming out of Ken's presentation, but perhaps directed to the NRC. And that's about the fourth task that was identified as a result of the previous comment period and scoping processes for laboratory tests on actual fuel.

It's been mentioned and published that this is proceeding according to a different schedule, and I'm wanting some information about what that schedule is. And then also a second question, what are the plans to synthesize the results of the fuel tests with the results of the cask tests and how will those -- does the NRC intend to present those are two completely separate studies or, again, in some way synthesize the results?

MR. CAMERON: Who wants to handle that?

DR. MURPHY: I guess I'll handle that if I get the questions straight.

We do not have at this stage a visiting milestone schedule for the fuel tests. They are very definitely still part and parcel with the Package Performance Study. The final report on this will include a synthesis of the fuel tests and the implication to those with the impact and the fire tests that particularly will be with the impact. We will be looking at the stresses and strains that are placed upon the fuel in impact situation. That's why we mentioned that we will have surrogates of fuel assemblies in both the Holtec and the GA-4 casks that we will have an idea of what stresses and strains will apply to them.

MS. GUE: Thank you, but can I just make a clarifying question.

MR. CAMERON: Yes, just for clarification so everybody understands your question. Is that question about the fuel testing as it relates to one of the five elements in the Issues Report that Ken mentioned, that's not part of this but Andy explained the relationship. Yes, Lisa?

MS. GUE: So when it's mentioned that the impact and thermal tests in the Package Performance Study are scheduled to be concluded in 2005, can I understand then that the fuel tests -- or you don't have a specific schedule, are also expected to be completed by 2005 in time for that final report?

DR. MURPHY: That would be correct.

MS. GUE: Okay. Thank you.

MR. CAMERON: Okay. Great. Thank you. Thank you, Andy. Thank you, Lisa.

Let's go to Bill Sherman and then we'll come up to Charlie Pennington. Bill?

MR. SHERMAN: Thank you. I'm Bill Sherman, state of Vermont.

I may have missed this, but did you mention how this is being funded?

MR. CAMERON: Is that Andy again or are we going to go to Bill Brach or Rob Lewis?

DR. MURPHY: I am not 100 percent sure how to answer your question. We have, the NRC, a budget for this program that I'd like to say if Congress has seen the merits of carrying this out then we anticipate that we will have full funding to carry out this program.

MR. SHERMAN: I guess I can be more clear. Do you expect the funding to come from the Nuclear Waste Fund?

MR. CAMERON: Bill? Bill Brach?

MR. BRACH: Thank you. I understand the comment as well as the interest in the funding aspect. As Andy mentioned, clearly and as evidenced by everyone's participation here and the large audience participation as well, there's very much a broad interest in the conduct of this activity. And realizing too, as both Ken and Andy have mentioned, that the costs of these tasks are significant. And one reason for our active effort on our part to engage the public is that to be sure that to the extent that when we carry the tests out that we have as best as we can considered and represented the views of broad section of stakeholders because the costs of the tests are such that we will not be in a position to have repetitive tests, if you will to now that we've done this, let's do a follow on test.

We want to be sure as we can that we have considered all the appropriate parameters and conditions in the conduct of the test now. And that's from the standpoint of the significance and costs of doing the test.

As Andy as mentioned, within the NRC we're looking at the budget for the tests and understand that within the NRC the conduct of this activity is part of the NRC's hallowed Waste Fund activity, if you will. And that to the extent funding would be presumably from the Waste Fund. But we are looking at various avenues for funding to support the conduct of the test.

MR. SHERMAN: Thank you. If I can just make a follow up comment, and that is as you know you have a strategic task goal of enhancing public confidence, but you also have a strategic task goal of reducing unnecessary regulatory burden. And if what you say is true, that it comes from the Nuclear Waste Fund, then the paymaster for this are the ratepayers, who I think if I've gotten the name cards right, I'm the only representative at the table that is a ratepayer advocate. And so I would suggest that you include those stakeholders in your talks, particularly members of the National Association of Regulatory Utility Commissioners, NARUC, and that to assure that the strategic goal of reducing unnecessary regulatory burden is considered in commiserate proportion with enhancing public confidence.

MR. CAMERON: Okay. Thank you, Bill. And I know that we do have a NARUC representative with us at the hearing today.

Charlie?

MR. PENNINGTON: Thank you. Charlie Pennington, NAC International.

Just a quick statement of thanks for holding this meeting, for allowing this. I think it's an important process and we do like the open process here. So thanks ahead of time. Depending on how the day comes out, you may not be hearing that from any people late in the afternoon, but just wanted to say thanks up front.

A quick comment, question, Ken. And I apologize if I have not picked this out of your protocol work, but with respect to the GA-4 thermal test, you know that impact limiters have two functions. And I'm a little bit interested in how you modeled prior tests with the GA-4 with respect to the real impact limiters or as opposed to dummy weights on the end. And second of all, could you characterize briefly for me what the shoulder design is of that GA impact limiter?

MR. SORENSON: Let's see, for the thermal test or for the drop test the impact limiters were not specifically modeled, but the mass was put in there.

For the thermal test the impact limiters were not included on the analysis.

MR. PENNINGTON: Why not?

MR. SORENSON: This was a scoping study to see how the different casks performed. And, again, there's no decision at this point whether, you know, the length of the fire, whether the impact limiters will be actually on there or not.

MR. PENNINGTON: Well, I think for clarification. In fact, I would greatly appreciate it if you would clarify that based upon many, many fire tests that the performance of those seals with impact limiters, because we know that the other function of a impact limiter is to protect seals from flame impingement, if you could characterize that as an extremely imperative element in the modeling state.

MR. SORENSON: Yes. Absolutely. Yes.

MR. PENNINGTON: Thank you.

MR. CAMERON: Thanks, Charlie.

Let's go to Rick Boyle and then we'll go over to Kevin Kamps.

MR. BOYLE: Thank you. Just a brief question for the NRC. I agree that you have a unique and somewhat expensive test program with an objective to benchmark codes. Is there any thought or possible benefit to offering the opportunity to model the cask to foreign countries so that they can benchmark their codes as well? Thank you.

DR. MURPHY: We've had a fairly extensive program in contact with foreign governments and foreign contractors that handle it. That's an opportunity. Exactly what shape that's going to be, we don't know yet. But outside folks say this will be the analysis, but it would be a round robin style, something simple.

MR. CAMERON: Does that answer that for

you?

Kevin?

MR. KAMPS: Yes, I can talk about this when there's more time in the discussion later, too. But, again, we're very disappointed about the lack of certain physical tests taking place, such as a crushing load test, the torch test. Especially concerning is the lack of any testing for submersion, especially given the Department of Energy's proposal to use barge shipments during the Yucca Mountain program. And one of the most important ones that's missing is the testing on anti-tank missiles and high explosives so the terrorist scenario tests are again lacking.

And I think just in a broad perspective on this, I've heard enhancing public confidence, but I haven't heard much about enhancing public safety. So I'm really questioning the motivation for the PPS at this point.

MR. CAMERON: Okay. Some of the issues in regard to crushing load, submergence, torch, I think, let's play those into the discussion areas. I think that your point about the anti-tank terrorism connection should address that and answer that now. And also your second point about public confidence versus -- well, not versus, but the public safety element I'd like the staff to address.

First of all, how are we, if we are, addressing the anti-tank terrorism issue in terms of these casks. And secondly, can you just comment to Kevin about his point that where's the public safety aspect of doing those protocols.

Bill, do you want to handle the first, at least, or both?

MR. BRACH: Let me if I can try to respond to both concerns.

One, the Package Performance Study if we go back to 1999 when we first were developing and asking for input and comment, was envisioned to be a test of the safety, the robustness of the cask in accident conditions and extra-regulatory accident conditions. Consideration of terrorism, sabotage was not and has not been included in the test. That's not a reflection that that's not an issue or concern.

What I was saying, that's not a reflection on our part that terrorism/sabotage is not a concern to the agency. I can't go into the details, but I think many of you are aware the agency since September 11th has taken a number of regulatory actions both to address spent fuel transportation, spent fuel storage as well as other reactor activities that we regulate to enhance and increase the level of protection against terrorism or sabotage types of issues or concerns. So I wanted to pointed out that terrorism not being a part of the study is not at all reflective that we're not addressing and considering those issues outside of the scope of the Package Performance Study.

I do want to mention, though, that there are aspects of the package performance study that clearly will be providing information to us, useful in a broad context.

Ken had in one of the overheads a picture of a -- excuse me, a schematic of a cask in a severe fire scenario as well as a drop scenario. So you could think about different conditions or scenarios where those originating actions could be the result of a terrorist or a sabotage action as opposed to what we're looking at in this particular case of it being the result of an accident, if you will.

So, I just wanted to stress that while the PPS study is not specifically in our modeling addressing sabotage as the, if you will, initiating event, there are other actions the agency has taken to consider that now and we continue to look at that issue.

With regard to public confidence, I mentioned in the opening comments a concern we have and an objective we have, and that's really, if you will, an underlying reason for the workshop that we're having today, meetings later this month in other locations, as well as the previous meetings. And that is to try to ask for and receive and then understand a broad spectrum of stakeholder views on the tests and conditions that we're considering. That on our part is an effort to try to: (1) engage with the public, but also to help build, if you will, that bridge and that understanding and hopefully bridge to the understanding and gaining confidence on broad stakeholder's part, public and public interest groups, individual members of the public and other stakeholders as well on what we're doing, the basis that we use to conclude that the actions we're carrying out are providing for us safe -- in this case, safe transport of nuclear material.

As I mentioned in the opening comments, we're very confident with regard to the adequacy of our current rules and regulations to assure and provide for safe transport of nuclear material.

The tests we're planning and discussing now are to look at extra-regulatory accident conditions to understand how those casks, in spent fuel how the spent fuel casks would withstand those extra-regulatory tests, conditions and parameters. And we're planning, as Andy walked through, very much of an open public process to have a public availability to observe the tests, public availability to have available the results of the tests, public availability of the conclusions we've reached in looking at the same test data and results as observed by the broad spectrum of stakeholders so that the conclusions we reach would be based on information that is widely and broadly available to all the stakeholders in the conduct of the test. That on our part is an effort to, if you will, engage but also hopefully gain public confidence in the conduct of these activities.

MR. CAMERON: Well, let me just follow up with two questions to make sure that we address Kevin's question.

One is you alluded to the fact that we're going to be addressing these terrorism considerations in other forms. The first question, I guess, is there a specific initiative that we're taking to do that? And I guess the second follow up question is, is one of the objectives, and I forget whether it was in yours or Andy's or Ken's slide, is a confirmation of the basis for the existing regulatory framework which would be, I guess by implication, addressing the public safety part of it as well as what you said?

Could you just answer those or give us any more information on that?

MR. BRACH: I think I'm going to start with the second point first, and that was one of my overheads that made reference to the confirmatory research nature of the Package Performance Study. And clearly a purpose of the study is to confirm the robustness of these tasks to withstand accident conditions markedly beyond our regulatory standards, if you will.

Secondly, with regard to security tests, another forum. I mentioned since September 11th the agency's taken a number of actions through advisories and orders to various licensees and regulatory activities we regulate to enhance the security of those measures. We as well have underway a number of reviews to look at the robustness, the capability of our regulatory activities, whether it be spent fuel transportation, spent fuel storage or other regulatory activities that we're involved in to assure the safety and security of those measures.

Now, those activities are separate from the Package Performance Study activity we're talking about today. And much of that is actually of a classified nature and I really can't go into much in the way of specifics, other than that that is being looked at. And as I was trying to stress before, there may be information, I expect there will be information, that evolves from the Package Performance Study when we're looking at impact results and fire results that would as well be useful in input to our considerations in the security, if you will, side of the reviews and regulations.

MR. CAMERON: Okay. Thank you.

Let's go to Alan and Bob and then let me do an agenda check with you, since we're obviously running overtime, which is fine. But let's go to Alan and then we'll go to Bob.

DR. SOLER: Jim, I have a question. Do you have a feel at this point as to the entire cost of the program that you've proposed if nothing changes? And by that I mean building the facility, procuring and instrumenting the cask and analyzing the results. In particular a breakdown of those items, percentage of total cost?

MR. BRACH: If I could maybe interject rather than Ken. I understand the question, but I'd ask that the purpose and focus of our discussion today, clearly cost is an important element and we within the NRC need to be sure that once the test plans have been finalized following our outreach activities and determinations made within the NRC, an important element on NRC's part, on our part is to assure that funding is there and is adequate to carry out those tests that we're planning.

I believe the ramifications of a specific test or breakdown of tests, I would offer I would like to ask if we can keep our focus and direction today on types of tests, types of conditions, parameters to consider and, if you will, the why part behind that so we can understand from yourself and all the other stakeholders' perspective so that we can then step back and help fashion a test plan that is responsive to the comments and views as well as responsive to what we were laying out as the objectives of the test plan.

DR. SOLER: Yes. I had asked that question primarily because I've heard the statement that we've got one chance at this, and therefore we've got to do it right the first time. And I was trying to get a feel for really what the incremental costs would be of doing it a second time once you have the major components constructed. Because my own personal experience we learned a lot about predicting what happens by embarrassing failures at the outset.

MR. CAMERON: I think there will be room to bring this point up again, Alan. But what you're suggesting is that the NRC should at least consider, and of course it's an important consideration, but don't just close the door at this point in time to be able to go back and revisit through a second test?

DR. SOLER: Actually, and I'll say it later in more detail, that if I look at this package as it is and if the test confirms this, that what I've done is proven that the impact limiter works well up through 75 or 90 miles an hour. But I haven't really proven that an elaborate finite element model of the cask will be sufficient to predict a what-if scenario if something happens at 125 or 140. And I was examining, you know, how do you do that with this test as it stands?

MR. CAMERON: Okay. That's great. And I see Bob Halstead shaking his head in agreement with that. And I think we'll get into that discussion with Bob.

MR. HALSTEAD: I'm not going to take the bait on that, because that's a wonderful topic that we all need to discuss.

Two quick comments. Fred and I have done a fair amount of costing work. We feel if you propose testing, you need to have a sense of the costs. And we plan to get into that, Bill, in some detail as we talk about the specific testing areas this afternoon. I think it would be distracting if we do that now.

Secondly, regarding Kevin's concern and some other people's concerns about the terrorism/sabotage issue. Let's remind ourselves for the record that in June of 1999 the state of Nevada filed a petition for rulemaking requesting both a reassessment of terrorism/sabotage impacts and requesting immediate changes in the regulations based on existing knowledge.

The NRC accepted that petition for docketing under docket number PRM73-10. The comment period was extended into early 2000. Golly, we're now almost 3 years into that and we have not heard anything from the NRC on how they're going to respond to that petition for rulemaking which addresses not only the issue of cask vulnerability to high energy explosive devices, missiles and shaped charges, but also addressed the issue of the possibility that terrorists would try to attack infrastructure to cause worse case accident conditions to occur.

Nonetheless, it is important to add, without going into any detail because it does get into safeguards information, that Bill is correct in his statement that a number of the immediate relief changes to the regulations that the state of Nevada requested in that petition have, in fact, in one way or another been addressed in these interim directives. Nonetheless, we are still waiting for a formal response to our petition for rulemaking.

Thank you.

MR. CAMERON: Any word from the NRC on the status of that particular petition?

MR. BRACH: This is Bill Brach.

Bob, your comment and the dates, I don't have them handy, but I generally recall that that's about the right time frame for the submittal and, yes, about 3 or 4 years have elapsed in the intervening time.

I mentioned earlier, and I would just draw everyone's attention again to the events of September 11 and the petition that the state of Nevada had submitted to us. And it dealt with physical security for spent fuel transportation. It was under review and the September 11th events were rather eye opening to us all, whether it would be involved in nuclear or other activities, with regard to the threat environment changing terrorism issues and concerns. And I would note, as Bob as mentioned and I can't go into details, many of the actions the agency has taken since September 11, whether it be for spent fuel transportation or other regulatory activities we regulate, are very reflective of some of the considerations in the petition from the state of Nevada from 1999.

I believe there was a communication to the state. I believe it was the end of the last calendar year, November/December time frame, that provided a very brief summary with regard to the status of NRC's review of that petition in noting that those issues are still under review by the agency. And we have not yet taken a formal agency action to close and disposition the recommendations from the state in their petition with regard to rulemaking actions on our part. So it's still under active review and consideration. It is not lost, albeit it's been 3 to 4 years now since we've had the petition. But I just want to draw your attention that in the intervening 2 years the September 11th events have caused us to re-look and reconsider a number of actions, many of which as I mentioned are included in the Nevada petition.

MR. CAMERON: Okay. It's not lost.

DR. SOLER: Thank you.

MR. CAMERON: All right.

We'll go to Ed Wilds. But what I'd like to do before we break is to at least do our segment on participant interest. And I think we're sort of getting our statements of participant interest in a way here. But, as I mentioned before, that's an opportunity for all of you to just give us 2 minutes or so on what your major concerns are with this. And when we go to that, I'd like to start with Abby, if that's okay with you, Abby, and go clockwise.

So let's go to Ed for a question and then we'll talk about participant interest.

Ed?

MR. WILDS: Yes. I'm trying to understand where you're going to place the surrogate fuel element inside the cask for the test and how you made that decision, and how that will relate to the impact tests for the fuel element because that will all have to be linked together for public confidence.

DR. MURPHY: We have not made a decision as to where in the canister or the cask the surrogate element will be placed. I would appreciate your comments. And one of the questions is, is one surrogate element assembly sufficient? And if it's not, or even if it is, where should it be placed and if there should be more, where should they placed? That is open to discussion and comment.

MR. CAMERON: Okay. Thank you.

Abby, would you like to start us off?

MS. JOHNSON: Sure. Thank you, Chip.

My name is Abby Johnson, and I'm with Eureka County, Nevada. I'm their nuclear waste advisor. Eureka County is one of the counties that could be the host to rail spur to go from the Union Pacific line south to Yucca Mountain. And we're the first county, so we'd be right at the Y where the spur would come off the main line.

So we're at the draining end of the transportation funnel. Here's the funnel, here's us.

And so from our point of view, we're a very unsophisticated rural county that's trying to make sense of the many federal agencies that are involved in this. And, of course, we're the first line of defense when it comes to any kind of safety issue for our residents. And so that's our perspective on this.

I was at the Nuclear Waste Technical Review Board meeting last week in Las Vegas. They did two panel meetings. And I heard the words "public confidence" ten times, and I've already heard them about ten times this morning. I don't know what that means anymore. And before if the purpose of one of the major 3 purposes of doing these tests is public confidence, I think you'd better be darn sure of what public confidence you're seeking and how it all works.

In just reading the document, public confidence that models can be used as reliable predictive devices. Public confidence that casks will contain the waste in an accident. Public confidence that the existing cask regulations, the existing regulations that you have for casks are adequate for today's materials and conditions. Public confidence that the government and the nuclear industry are being truthful about the hazards of nuclear waste transportation. That's four kind of different public confidences.

The other part about public confidence that I'd strongly like to see as part of the equation is common sense. And when I'm trying to explain to the residents of Crescent Valley, Nevada what's going on with this whole huge complex issue and they say things like "Well, what if somebody shot a missile at the cask, would it leak?" I go "Well, I don't know." And they say "Well, aren't they doing these tests?" Yes, but they're not going to do that, that's a different thing and they're just going to model that and that's a separate thing. And that does not build public confidence.

And so the reason why I'm here today is represent the draining end of the funnel and just to kind of say don't forget common sense when you're doing this. And remember the public isn't the people in this room. The public is a different -- if you're looking for public confidence, you have to be able to explain your decisions to regular people and you have to be able to figure out what you're looking for with public confidence. And I'm happy to be the sort of common sense public confidence meter today, if you need that test.

Thank you.

MR. CAMERON: Thanks. We'll get you a bell. But that is a good example of when we get to the overarching issues of, you know, one of the criterion, and that may be too precise a word, but one of the criterion of public confidence maybe we should have a discussion about what are the elements of public confidence so that we can be a little more precise about that.

Thank you.

Lisa?

MS. GUE: Again, I'm here representing Public Citizen, we're a national nonprofit public interest organization. And most of our 150,000 members, as well as many of the local and state based organizations that we work in coalition with, are living in states that would be highly effected by the current proposals for high level waste shipments to either Yucca Mountain or private fuel storage at Skull Valley.

Beyond the specific scope of the Package Performance Study we have long advocated for full scale physical testing as a condition of cask licensure. And so I guess one of the concerns that I bring today is about the presentation of this study. We are clear that the one time confirmatory tests being proposed here is no substitute for upgraded regulations that would require physical tests as a condition of licensure. And there seems to be, again getting back to this issue of public confidence a little bit too, there seems to be some confusion as this -- I don't know if it's presented or interpreted as the be all and end all of physical testing for nuclear waste transportation casks and the one time response to the wide spread public concern about the adequacy of regulations to guarantee safety.

Getting back to the specific scope of the PPS, if we're going to talk only about a one time confirmatory testing, we're interested in information about cask failure points and we're concerned that the draft protocol do not consider tests to destruction as well as the limited scope in which tests are being done, as Kevin mentioned earlier.

And then I guess I also bring a general critique of the NRC's singular focus on risk informed management. We feel that it's important to recognize that the extreme consequences of some accident or attack scenarios may warrant consideration even if they carry a relatively low probability or an undefined probability.

And finally, just a concern again about the motives for this study and the timing of this study. Since the NRC is likely to make a decision on their private fuel storage license applications before this study is completed. I'm also wondering, I guess, how the decisions were made to hold these meetings in Rockville, Chicago and Las Vegas and not for example in Salt Lake City or in North Carolina where most of the current nuclear waste shipments are happening.

So, looking forward to the day.

MR. CAMERON: Okay. Thank you. Thank you, Lisa. And I'm going to put that issue in the parking lot for right now in terms of how the meeting location and timing, and come back and try to give you an answer to that, okay? All right.

John Vincent.

MR. VINCENT: I'd just like to emphasize for all the participants here that what we're really talking about is a set of circumstances that deal with extra-regulatory testing. The industry has believed for a long time and continues to believe that full scale cask testing is not a necessary condition of cask certification and should not be employed as such.

There are a lot of things we do today that we can do extremely well using component testing where it's necessary, scale model testing and highly efficient and much improved computer simulations which will allow you to do testing multiple times over and over again to understand what the true sensitivities of the cask performance really are to real world circumstances.

We've, all along in our regulatory scheme, involved severe accident conditions as part of the criteria for the development of the cask designs and the certification requirements. That's still true today. The requirements, as explained in the modal study and follow on, are that one in 10,000 cask incidents that you might think about in their harshness or however you choose to characterize them, might not be covered by the current regulatory scheme. That's a pretty small fraction and it's hard to imagine things beyond that that you could actually come up with that would be a situation which might be probably normally incident to transportation.

We're also concerned about public confidence building. And we understand, in fact as Amy pointed out, that there are various aspects to that and those need to be understood. We're very much interested in improving that as a matter of the industry's performance. We would encourage the NRC as part of this to make sure that they do things that would facilitate that.

But having said that, I think it's important that we recognize at the outset that in fact doing these tests to accommodate scientific data collection and doing them in support of public confidence in whatever aspects that you may define in terms of its elements, may in fact be mutually exclusive or may in fact be in such a circumstance that the NRC ends up satisfying no one, either the engineers or the public, if it tries to serve both of these purposes with one test.

And we'll have other comments through the day about the specific items. But I think up front that's where we are.

MR. CAMERON: Okay. Thanks, John. And you raised another point for the overarching issues discussion, it's what's the relationship between these various criteria, public confidence and for example realism; how should they be balanced. So we'll get to that discussion.

Let's go to Bob Halstead.

MR. HALSTEAD: Thank you, Chip.

State of Nevada has proposed full scale cask testing for at least 15 years that I'm aware of. And when St. Patrick's Day rolls around in a week and a half, that'll mark 25 years since the first time that I got involved with the full scale cask testing issue. And in all that time I can't ever remember the NRC holding a meeting solely for the purpose of discussing full scale testing. So this is a special occasion, and I acknowledge and appreciate the fact that you are holding the meeting and that you've invited the people who are around the table.

The proposal that Nevada has made is

described in a paper that I'm going to pass around. And there are copies on the table outside the doors to the room.

Essentially, our proposal differs from the NRC's proposal in that we still believe that both technical detail and public confidence in testing can best be through a combination of mandatory full scale regulatory testing of casks that's according to the performance standards in 10 CFR 71. And then in addition to that we'd like to explore the extra-regulatory area through some combination yet to be determined of computer simulations, scale model testing, full scale testing, component testing.

We describe our approach to these tests in the paper and we've attached costs to them given the best of our ability to ascertain those costs.

From a public confidence standpoint, I think that the way the NRC is handling the draft testing protocol is a pretty good model. Unfortunately, it contrasts sharply with the way that the Commission and its staff have handled certain other recent proceedings which have the effect of undermining public confidence. Let me give you an example.

Some of you have had a chance to read the NIST contractor report on the Baltimore Tunnel fire prepared for the NRC. It may surprise some of you to know the history of that report. It may surprise some of you to know that in July state of Nevada consultants were barred from attending NRC meetings regarding that report. We're still not sure whether they had a legal basis for excluding us from those meetings, but it sure as hell undermined our confidence in the proceeding.

Further, the document as you can tell on the publication page was prepared in August. It was released about a month ago. And we were forced to file a Freedom of Information Act, which as of last count we've spent about $2,000 on without receiving the report.

We dispute the assumptions and the findings of the report. And, frankly, this has reached such a point that the only thing that's going to allow us to have confidence in this report is for the NRC to bring the authors, the contractors from NIST to the meeting and we will be happy because we've done a very detailed technical review of this report, including the critique of the tests that were done at the West Virginia University tunnel facility. And we would like to go into those issues in detail. And we still believe and agree wholeheartedly with Ray Manley's contention that the Baltimore fire ought to be the standard that we look at to see if the thermal test reflects what can happen in the real world. Unfortunately, instead of having a technically objective and unbiased report that captures to the best of our ability what happened in that tunnel, we now have a report that we believe is seriously deficient both technically and in terms of public confidence.

Thank you.

MR. CAMERON: Okay. And, Bob, just a couple of clarifications. When you talk about the fact that there should be a regulatory confirmation component as well as an extra-regulatory, is that pretty consistent that regulatory confirmation with Lisa's point about bringing this into specific licensing for a specific cask?

MR. HALSTEAD: Well, I don't want to be

presumptuous and speak for Lisa's proposal. Our proposal is the same as it's been since 1997, which is that we believe that each of the casks used for Yucca Mountain shipments should preferably be tested full scale as part of the certification process at the NRC.

Now, we understand there are a lot of reasons why NRC doesn't want to go that way because they regulate casks that are used for other shipments. Because of the cost issue and, Bill, I hope we'll talk about this this afternoon, our secondary recommendation would be if the NRC doesn't want to do that, perhaps the most appropriate way is for the Department of Energy to put a procurement requirement on its contractors that any of the casks used for repository shipments would be demonstrated to meet these tests.

I realize that this is now complicated by the PFS proposal, and I haven't completely thought through the institutional issues there. If there is not a PFS facility, we calculate that over the next 50 years shipments to Yucca Mountain would probably represent an excess of 95 percent of the spent fuel shipments, and therefore that's why we focus that way.

MR. CAMERON: Okay. Thank you. And we will be getting into the Baltimore tunnel in spades later this afternoon.

Fred Dilger?

MR. DILGER: Fred Dilger, Clark County, Nevada. Clark County Nevada is where Las Vegas is. We are also at the region of the nuclear waste shipments to the proposed Yucca Mountain facility. Under three of the four possible rail routes to Yucca Mountain, 85 percent of rail shipment will traverse Clark County. If the waste travels by the mostly truck option, Las Vegas and Clark County will have between 6 and 11 trucks of high level waste traversing it for the duration of the program between 24 to 38 years. So we have a definite stake in this issue.

First, I want to thank the NRC for having these meetings, having these meetings early on in the process. We did a lot of investigation talking to other NRC staff about trying to identify whether or not decisions had already been made and whether or not these meetings would be a useful place for us to participate. And everything we've heard back and everything you've said today says that, yes, we are early enough on in the process for our input to make a difference. We appreciate that.

There are a couple of issues that we're very concerned about. The first is NRC's commitment to the testing program. We understand that in a draft document like the protocols you don't want to be held to any particular testing regime, but we would like to see NRC's commitment to the process reflected in some kind of discussion of the budget and a clear statement, unambiguous statement that the NRC's dedicated to doing these kind of tests. We've heard some of that today from Bill Brach.

We're also curious to find more about the priority of the tests. From what we read in the protocols it seems as though there is an emphases on the drop test, and we're not sure if that's appropriate.

We think the role of the stakeholders needs to be clearly specified in this. As Bob mentioned, it's alluded to and described carefully in the paper that's available to you. The model for that is the stakeholder participation and the TRUPAK 2 testing that went on for the WIPP facility. Alan's point is very well made because they learned a lot in those tests, and as I understand it, actually redesigned the cask a little bit as a result of that test.

The final area that we have a big question on is in that cask selection. We'd like to hear some more today about the rational for cask selection. I've talked to Dr. Murphy a little bit before the meeting, but to hear a little bit more about the cask selection process would be very helpful.

That's all. Thank you.

MR. CAMERON: Great. Thank you. And we will talk about cask selection and also I think during the overarching issues discussion we'd like to hear more about exactly what the TRUPAK public participation process was, and get reactions of other people to that.

Alan?

DR. SOLER: Alan Soler of Holtec.

I'm here, really, I would say wearing three hats. One is, obviously, a vendor.The other as a public citizen because I have two sons that are directly in the business as well. And thirdly, as an analyst to make sure that when these tests are finished, that we get the most bang for the buck, if you will. That we're not only able to prove that for, what I'll call, reasonable extra-regulatory accidents everything works as it should, but also be able to instil public confidence that we can take the most widely inconceivable accident and simulate it with a computer model and prove that, yes, even in that case everything still works or at least be able to know exactly what fails.

MR. CAMERON: Okay. Thank you.

Bob?

MR. FRONCZAK: I guess I'd like to reiterate some of the things that Dr. Soler just said.

We've never taken a really strong view on full scale testing. But having said that, we see full scale testing as an opportunity to answer some questions.

The rail industry, their primary interests are safety and efficiency; safety of the public, safety of our employees and the efficiency of the rail network and be able to deliver freight to our customers. What we see as an opportunity of these tests is a way to answer several questions that we've got.

One, and I see this happening, is that use this to input to the models to confirm that the models are legitimate. Ultimately use those models to figure out when the cask can fail. Take that information and figure out are there any credible accidents that can occur that would fail the cask. If that were to occur, then we have to figure out how can we mitigate that. And an example of that might be the cask, maybe it can withstand a one hour fire, you know emersion fire, but what if it's two hours? You know is there a way to vent and burn a car that might be impinging on that cask within that period so that we can prevent any failure of that cask.

Finally, a couple of other things. We would like to figure out what can this test tell us about crush loading. I know it's not designed to address crush loading. But the back breaker analysis or test might be able to help us understand that a little bit better, because we feel that that's a possibility in rail accidents.

And the finally, again, if we do have to deal with an incident, what can we do to get that situation mitigated, cleaned up so that we can get the railroad back in operation.

Thank you.

MR. CAMERON: Okay. Thank you, Bob.

Ed?

MR. WILDS: Yes. You know, we support Package Performance Study, we do have a couple of little concerns. Looking down the future there's all the discussion on, you know, this will confirm the models and you're going to prepublish the criteria. But, you know, we see no discussion of what if the models are not confirmed, but where do we go from there? And that gives us some concern. And with that question in mind, then the other question is are you choosing the criteria so that the model is confirmed with a single test only in advance? You know, there will always be that question.

So I think from our standpoint and my personal standpoint that you'd have to do it more than just a one time shot. The one time shot will enable you to improve the models, fine tune them a little bit and then, you know, use the second for subsequent tests to confirm those corrections to the model. And that way, also, you don't have that condition of well whatever criteria you chose in the beginning, you chose it to make sure that you confirmed the model just because you only had one shot to confirm.

MR. CAMERON: Great. Thank you very much, Ed.

Kevin?

MR. KAMPS: The main interest of Nuclear Information and Resource Service is public safety and not the nuclear power industry's bottom line or schedule considerations. And so that's why we would hope that the Nuclear Regulatory Commission would require full scale physical testing as a part of the certification of transportation containers, and that that would include under water submersion, tests and crushing loads and torch tests where propane tankers could create an intense hot torch on a nuclear waste transportation container in addition to what's being talked about today.

And a concern that we have is that the

Package Performance Study not become a public relations exercise, and that's what really concerns me hearing the words "public confidence" again and again. We really hope that, unlike the past, the films that are being talked about in the PPS that will be taken of the tests will not end up in the next NEI video about how safe nuclear waste transportation is. That was used as a lobbying tool leading up to the Yucca Mountain vote complete with fake sound effects, which was not the intentions of the tests in the late '70s and early '80s.

And along those same lines, this trade-off between public safety and industry profits, I think the Davis-Besse fiasco is a good example of public confidence would kind of follow from a devotion to public safety. And the Nuclear Regulatory Commission talks a lot about public safety, but as Davis-Besse shows industry financial considerations sometimes overrule NRC's interests in public safety.

And a recent NRC decision right around Christmas time that terrorists attacks are too speculative to consider during licensing proceedings is another blow not only to public confidence but also to public safety.

And attending the Advisory Committee on Nuclear Waste in November I was amazed that during the presentation of the Baltimore tunnel fire analysis by the NRC, that the impact of the fire on the radiation shielding in the container was beyond the scope of the analysis. And so that came out during the question period after the presentation that the radiation shielding really was not considered. And so the big question was well what about the safety and the very lives of the emergency responders who would be sent into a situation like that.

So time and time again we are seeing a neglect of public safety. And that's a big concern of ours and that's why we call for very vigorous testing of these containers. And it's often missed, the very deadly nature of the material that's contained in these containers, and that's what we're most concerned about.

MR. CAMERON: Okay. Thank you, Kevin. And I think you sort of raised some of the points that Abby may have been concerned about, just in terms of being specific about what is meant by public confidence. And we'll get to that Baltimore. Let's talk about the shielding issue when we get to the Baltimore tunnel fire and how that relates to the draft test protocol.

Rick?

MR. BOYLE: Thank you. I'm Rick Boyle with the Department of Transportation.

As a regulator of transport, I think our objectives are very similar to what was presented by the NRC in the earlier slide, so I'll not go through their presentation again.

I think we all at DOT are interested in the adequacy of the analytical methods in the extreme conditions. And we're also encouraged and confident in the discussions that are being brought forward now that we're going to look at those results and really bound them, and see yes it's extreme or it's extra-regulatory, but how far can you go with that and what does it really apply to and would further testing need to be done to expand that envelop further.

So, we're encouraged and, again, confident that that work will be done as we progress through the study.

I think it's important to say this is far from the first opportunity or the first timewe or the NRC have been involved in public safety. But I do think it is early in our public involvement and public participation or public conception efforts. And I, for one, applaud the NRC. I think they're ahead of DOT in these efforts. I certainly think it's a step in the right direction, a big step in the right direction and I would encourage that to continue and not be, well, we did it once or twice because were told to and the effort stopped. I don't see that as their attitude, and I would encourage and push them to continue to have these meetings. And we certainly would be willing to participate whenever requested.

If I can look back to my role at the Department of Transportation, we have a much broader role in all radioactive material, so we're very interested in the results and the work that's being done in this Package Performance Study and its applicability to all transport packages, all type B packages. If you look at the numbers, no matter how big a PFS project is or no matter how big a Yucca Mountain project is, there will still be a lot more transport of other packages. So we're very interested in seeing how these results can be applied and how they will effect other package designs.

And because the people right on the other side of the wall from me, I do the radioactive material but the rest of my office does all the other eight hazard classes, I'm interested in being the liaison and taking these results and taking just the thought process behind this study into the rest of the HAZMAT division and see where its applicability and see how its usefulness can be applied in other hazard classes.

Thank you.

MR. CAMERON: Okay. Thank you very much, Rick.

And let's go to Mr. David Bennett.

MR. BENNETT: Yes. David Bennett representing U.S. Transport Council.

We thank you NRC for our opportunity to participate. We are a consortium of leading transportation companies and stakeholder customers who are obviously interested in the objectives of this program and the success of it.

In our view this program enhances some laudatory goals.

Number one, we reconfirmed the validity of the quarter scale testing today. And two, the enhancement of public awareness acceptance of the package performance testing. These attributes we believe are very positive. We do have some issues that we do think need to be addressed by the program.

The cost benefit of moving to full scale testing demonstrated above what currently is in place of status quo?

Should the test serve as confirmatory or should they move beyond the design basis?

In general, what would be the cost of the program for the benefits derived and will the cost of the program detract from dollars that are needed to begin implementation of the program for Yucca Mountain?

And will the U.S. Department of Energy, will their role be as a benefactor in this process?

And is it better to be more inclusive than exclusive with respect to the members of rail and casks that are tested? Are we then necessarily opening a Pandora's box for nuclear spent fuel transportation given the fact that current cask certification and test requirements have proven over many years their ability to protect public health and safety?

I guess in short we as a council share common ground with respect to overall objectives of this program. We definitely support safety. We are open to testing protocols and we believe the beginning of this implementation is an excellent place to start with an open forum like this, and we look forward to working further in any way we can as a council.

MR. CAMERON: Thank you, Dave.

Bill?

MR. SHERMAN: Bill Sherman from the state of Vermont.

I think that at the time I represent 3 interests. First the interests of my own state of Vermont. Secondly, I'm a ratepayer advocate, and so I mentioned that earlier. And third, as a member of the Northeast High Level Radioactive Waste Transportation Task Force, in general a regional representative from the northeast. With all those hats we're generally supportive and I think it a very good thing that NRC is proposing.

I have a couple of comments, and one I'll try and say as quickly as I can. Public confidence is something that comes out. Been said a lot, be said a lot more probably. But here's an interesting data point that I don't know if it got picked up. I don't know if the Northeast participated in previous discussions, in previous workshops, perhaps.

A number of years ago, six to seven or so, four regional groups sponsored by DOE through Council of State Government, and others, had the opportunity to vote on cask testing, full scale cask testing. It might be useful for you to know that the three of the four groups endorsed it, but the Northeast group did not endorse full scale cask testing, and I think there's a reason for that.

In the northeast we have never bought into the line that this spent fuel transportation that maybe upcoming is novel. We've had routine spentfuel transportation in the northeast for over 40 years. And I think that probably that vote where we declined to endorse full scale cast testing was because we are more used to it than the other regions of the country.

I only put that out to say this: That therefore, from the northeast perspective I don't think that we feel that this effort is necessary for public confidence, at least northeast public confidence. But I do feel that it's useful.

Now, having said that it's useful, I have one additional comment, and that is that there is a real danger in using conditions beyond what might fall within a reasonable bell curve of transportation.

Now I'll wear the ratepayer hat. It's reasonable for ratepayer hats to pay for confirmation of reasonable transportation accidents. I'm not sure that it's reasonable for ratepayers to pay for research projects to determine beyond reasonable bell curve accidents and certainly not determine tests to destruction. That's not a reasonable item from our point of view or from a ratepayer point of view.

And I think that concludes the comments that I have. Thanks.

MR. CAMERON: Okay. Thanks. And we have to explore that realistic bell curve accident when we go to the overarching issue.

Michael Conroy.

MR. CONROY: Michael Conroy again. Department of Energy, Office of Environmental Environment.

We are supportive of NRC's efforts in this area and in the process that they are undergoing in this meeting and subsequent meetings.

Looking at the reports, a couple of statements that we thought were worth mentioning was that, as NRC says, the current regulations and programs, transporting spent fuel do result in a high degree of safety. NRC's certification of spent fuel casks has contributed to an excellent safety record for transporting spent fuel. And the safety protection provided by the regulatory system is well established. As has been mentioned there's a long history over about the past 50 years. There's substantial experience gained in the transportation of spent fuel and high level waste. In the U.S. alone there's been over 2700 shipments of spent fuel traveling over 1.6 million miles. None of those shipments has resulted in the release of the radioactive contents. Similarly, there have been a thousand more shipments made throughout the world with similar safety record.

What is being proposed here should be remembered that we're looking at examining the adequacy of analytical methods used to estimate the response to improbable extreme accident events, not something of the ordinary every day occurrence. We anticipate that the tests described in the test protocols or as further developed will demonstrate the validity of computational methods that are used to model the response and should enable us to use those type of method. We would like to see that NRC make clear that these tests are not being proposed as new standards for package certification, but rather for the validation of the computational methods.

And also we'd like to emphasize that the test condition could be correlated to real world conditions of transportation as some of the discussions earlier about correlating drop heights to speeds to what it means on yielding surfaces versus unyielding surface so that people can have a better appreciation of the events like those and to real efficient transport.

Thank you.

MR. CAMERON: Okay. Thank you very much, Michael.

David?

MR. ZABRANSKY: Okay. Dave Zabransky from the DOE Civilian Waste Management program. Mike's program is actually working with licensing development operation.

From our perspective versus Mike's department, I would also just like to add that at least our role is to facilitate and not to participate. We do hope that you do define public confidence because it will help with public perception of this issue.

MR. CAMERON: Okay. Thanks, David. We'll look forward to DOE providing us any information we need today.

Charlie

MR. PENNINGTON: Thank you. An awful lot of big comments. I will say I'm speaking from the international viewpoint. Obviously a substantial fraction of tests have been done over the last decade.

I think that there's a misalignment here, at least my perspective being objective in cast program . I'm looking for firstly casting alignment. I'm looking for a little better alignment. I believe there's probably a divergence or at least a difference a difference in perspective between the capabilities of our analysis method and the demonstration of those analysis methods.

I hear the discussion here about upgrading regulatory models and we in industry, I believe, have a fairly high confidence level in what we've taken our modeling to.

This is a by-the-by, and to go back a little bit. Bill's folks have posed a number of upgrades and modeling capabilities over the last few years and appear now at the point of being able to predict millisecond-to-millisecond deformation in scale model and in some cases a full scale component test. We predict incredibly accurately at the conclusion of the tests by confirmation those deformation, and we have G results that are remarkably been within an incredible amount of accuracy to the actual performance.

So, I sense a disconnect here between the level of achievement with the industry and a getting a regulatory approval and what the regulatory body is designed to take its regulatory confirmatory analysis methods, too. So I think there's a little difference of perspective there.

Secondly, I'm surprised at how much my feelings resonate with some of the folks on the other side of the table. I believe that if you feel objective here is your first objective, you listed your first objective today contrary to the way you've listed in your protocol as is the public confidence. And for the types of accidents you're looking at, and I would endorse wholeheartedly my colleague from the DOT and the chairman's comments, I think they're right on the money. There is a very grave need to make sure that the testing does lend to public confidence. And to this extent we're not only extra-regulatory, we're supra regulatory in the testing. So my own feeling is I believe you have the opportunity to do something that I've been kind of harping on, similar to what Bob has been harping on. I believe comparative hazard assessment, a fundamental. I believe that public understanding is fundamentally based on informed consent. And the only way you can do that is to spend some money in relative assessment. I think Dr. Einstein had it right; it's all relative. I believe that's really an element, spending some money at Sandia to do some other analysis upgrades. I believe there should be some money channeled to work with compared hazardous testing and I think DOT would be a very appropriate participant in that. And I think I'll be giving you more details on that by the end of the day.

MR. CAMERON: Okay. Great. I was going to ask you to explain what you mean by relative hazard assessment, but you'll be going into later, so we'll wait for that. Okay.

MR. MANLEY: Ray Manley from the Maryland Department of the Environment. I'll just briefly go over again some of the comments that I made earlier.

We have a large number of stakeholders in the state of Maryland. We're very concerned in regard to conditions of casks that may result from a situation similar to the Howard Tunnel incident of July 2001.

Looking over the testing protocol, one of my major concerns is there just doesn't seem to be a clear fail criteria. I realize that the purpose at this time is the evaluation of the adequacy of the analytical method and the model used currently to credit the cask. But the results of these tests doesn't seem to say how that analysis and comparison is going to be made. And if -- and I would like to leave this meeting with clear ideas as to whether this type of testing is going to be sufficient from a temperature standpoint to stimulate the environment of that tunnel fire that occurred. And at this point looking at the test protocol, I don't see anything indicating maximum or minimum temperature criteria that way. Even though not being an engineer I can intuitively see that it may be very difficult to test these, more expensive to test these casts to the point of failure. It seems reasonable that with these tests you might be able to come up with a more adequate method to predict these tests to the point of failure using the model.

Thank you.

MR. CAMERON: Okay. Thanks, Ray.

Mark?

MR. HOLT: I just want to briefly clarify the role of the Congressional Research Service. I take any public policy issues. Basically we serve any member of Congress that has any concern in the entire range of this phase and we try to serve that. I know that there are members that have all the past studies. These cast studies are an extremely important element to raise. They are important to the findings they study. Keep in mind the effect of all the objections raised -- transportation, etc.

MR. CAMERON: Okay. Great. Thank you very much for that reminder, Mark.

We've gone overtime, obviously. Started late. But I think that this has been a useful foundation and I think there's been a lot of useful information already provided in terms of identifying issues. But also showing where different people are on the spectrum of opinion here.

Let's take a break. We originally promised a half hour. I think we're going to try to do 20 minutes and come back around 11:30. And then we'll see if we can go through some things quickly and still take a lunch break around 12:30, including audience participation. But I think we have time.

We'll see you around 11:30.

(Whereupon, at 11:13 a.m. to 11:44 a.m. a recess.)

MR. CAMERON: Okay. Let's get started on what we called overarching issues, and just reviewing what we talked about this morning. I just wrote some of the overarching issues down that you already raised and might want to discuss.

Which criteria should be used? I think the staff might have all be objective.

What is public confidence? Abby raised that and a number of other people talked about that. Maybe we can put a definition on what are the parameter of public confidence so it just doesn't become sort of a mantra. That's probably the wrong word, but what is public confidence.

What is realism? And Bill Sherman talked about realistic bell curve accident.

What's the balance between public confidence, realism? The other one was further confirmation, I think, of existing models.

We heard some process issues. Bob

Halstead talked about using a process such as we used with TRUPAK to help advise the NRC on -- and I'm taking liberties with advise the NRC, Bob. I'm not sure what you meant.

MR. HALSTEAD: That was Fred's.

MR. CAMERON: That was Fred's. Okay. I don't want to give the impression that the state of Nevada and Clark County are interchangeable. Much different. But Fred could talk to us a little bit about that.

Lisa raised the issue about why were these locations chosen, the implication.

Maybe we need more meetings. Rick Boyle said keep the meetings going.

I don't know if this last one is an overarching issue or not, or what happens if this model isn't confirmed? I mean, is that an overarching issue.

But at any rate, those are some of the things that I heard. Is this about right for starters to have a discussion and get some interchange between people?

John?

MR. VINCENT: Well, I think that my comment about one test satisfying both issues are both of your test wants; that is the scientific data versus real world or testing I think is a very good one that should be up there. It goes to a lot of those things.

MR. CAMERON: Okay. Let me make sure that I capture that one correctly. The lead point is -- why don't you state it rather than having me.

MR. VINCENT: Well, I think what I said originally was that for the purposes of the testing here, it may be that trying to do what you might do for designing a test for public confidence, whatever elements you ascribe to that definition, may not be the same as the ones you would employ if you were trying to get a good set of scientific data to benchmark codes, whatever. And as an overarching kind of thing, that leads you then in several different directions before you even get to the point of what are the acceptable test criteria, what are the acceptance tests for the data that you get as a result of the tests. And then also it addresses most of the other things that you put on the table there.

MR. CAMERON: Okay. It is a real

overarching question of can you really satisfy all of the objectives that are laid out in the test protocol with one test. And do you need to select one objective as a priority and base your test on that. I think let's talk about that, but let me just go to Bob and down to David and Mark first to make sure we have all the issues. But I think that you're right, that is a key issues.

Any other suggestions here?

MR. HALSTEAD: Yes. I want to save speaking to that issue until we talk about issues. But a holistic step back from that issue, the larger process issue, both Amy and Bill on different occasions over the last 2 weeks have assured us that from the NRC perspective everything is still open. And that's such an important issue. I want that put up as an overarching issue; that because of the technical elegance of some of the portions of the test protocol there may well be a tendency of some people reading that document to say "Okay, this is what they've decided." And, frankly, in a couple of areas that was my own feeling, and so that's why we've raised that issue. And if that is the case, and I'm going to take them at their word because you know when we don't like something the NRC does, we don't have any shyness about telling you about. But this, I think, is a very important and positive exemplar for public participation, the approach they have taken.

So, for example, Fred and I will be looking at our own proposal and trying to find common ground with the NRC's proposal informed by the insight that John has just laid on the table here; that if it's really possible for us to economize by accomplishing more than one object by a hybrid approach to what we've suggested and you've suggested.

I don't want to be made a fool of. I'm assuming that you've given us -- I mean, I make a fool of myself many times. But if you've told us that this is an open process and you're not locked in on that, then that we're going to take you at your word and we hope everybody else will.

MR. CAMERON: Thank you. Thanks, John.

Let's go back to that and deal with that first off, because that's an important issue. And then I think John is right, that what he's saying wraps up a lot of these -- let me get some further thoughts here before we delve into this.

David?

MR. BENNETT: Yes. Public confidence has been an issue and I think NRC recognizes that's important. But a comment was made by David during the break that really brought a big point. There is a point between public confidence and public awareness. And Bill alluded to the fact that we are not inundated with something new all of a sudden. Some of their very fuel we're speaking of has already been transported one, two, maybe three times. And I think NRC has a track record that is almost, maybe not perfect but close because it's been so many years so well.

I'm not sure we would gain a lot by going back to square one when we have a comfortable solid proven base to at least begin. And I appreciate that in the test protocols that they did leave open the fact that we have done this many times, and it's not new. We could maybe improve due to technology.

But I think a key point, public awareness and public confidence are not the same thing. And I think the public generally is not in this room, but they are not terribly aware of all that has been done in the technological sense, just the fact whether it makes the news or not. So I think that's a perspective we need to remember that we had it pretty tried and true to some points.

MR. CAMERON: Okay. I think that that's part of our discussion of what is public confidence. Kevin and others raised the point that, well public safety really leads to public confidence. And I think you're pointing out, although you and Kevin may disagree ultimately, I don't know, but you're saying that track record in making the public aware of that is one element of public confidence.

Let's get some more suggestions on this. But I guess what I'm looking for is to make sure that we have, and we can't discuss everything obviously, that we have the major questions for discussion.

Bob Fronczak, did you want to offer something?

MR. FRONCZAK: It may be incorporated in the issues you already have up there, but I just wanted to reiterate it, and a couple of people have mentioned it. We need to make sure that we can use the information that's generated through this work to figure out how that relates to real world accident.

MR. CAMERON: Okay. I read that the same as the realism, realistic bell curve accidents. We're talking about the realism part of the equation?

MR. FRONCZAK: If that's what you mean by realism, I guess I'm satisfied.

MR. CAMERON: Okay. Anybody want to do a quality check. When we talk about realism what Bob said, that's -- okay.

MR. HALSTEAD: I do disagree there, and I don't know if Bob's thinking this. But for example, I'm not sure the Baltimore railfire, where that falls on the bell curve. And I don't want the bell curve constraining what we deem to be a credible maximum severe accident. I've tried to avoid using that word "worse case" for a while. But isn't clear what determines realism to different people around the table.

MR. CAMERON: Yes. And I wasn't trying to say that. I just wanted to make sure that I had the same concept. But I guess, Bob, what you're saying is that just like you, we need to talk about what are the elements of public confidence. The other point is what is real or what is realistic. Is that the point you're making?

MR. HALSTEAD: Yes. And there's quite a bit of transcript on this from the earlier PPS meetings. It's one of the things that was only partially captured I think in the Issues Report. And some of it may be in that fifth task on redefining the eventuries and the frequencies based on updated accident data. Because I know, for example, we put in 20 severe accidents that had occurred since the modal study that we thought we were kind of analogous case studies for different types of insults to the cask. And we have not yet gotten any feedback from Sandia on how they handled that. That was our way of defining realism by saying based on the NTSB accident reports these, these and these real world accidents are what we think you should consider whether those type of accidents fit your probabilistic model or not.

MR. CAMERON: Okay. That's definitely an issue we need to discuss.

Lisa?

MS. GUE: I was just going to suggest as

an overarching issue the question of how does this study interact with theNRC's other specific licensing programs, I guess. One of those is just a general issue of the licensing regulations for nuclear waste casks. And the other is the reality that although this is being put forth as a generic study, that there are two specific proposals on the table right now that would drastically increase the amount of high level nuclear waste that's being shipped. And the issue or the question, I guess, that I had raised earlier in the comment time of, you know, that is raised by the fact that this study is not scheduled to be concluded before the NRC is scheduled to make a decision regarding the private fuel storage issue.

MR. CAMERON: Okay. All right.

Mark?

MR. HOLT: I would add as an overarching issue cost in the sense of how much is reasonable total amount to devote to this effort. Because that sort of seems to be implied that the current proposed program would not amount -- and anything proposed would have to do something else or -- to be accepted. So that would be an overarching issue to me.

MR. CAMERON: In other words, don't you have to ask the cost question in terms of is the cost worth the benefits. And that gets into, I guess, goes back to John's question perhaps.

MR. HOLT: Well, yes. If you do the cost benefit, then you've got a more difficult analysis of your total amount of the problem, would sort of be the idea.

MR. CAMERON: Okay. Right.

Let's hear from Fred and Kevin. And then let's start off on an issue and see where we go with it.

MR. DILGER: I'm sorry to even suggestan other overarching issues, because we might need a new special set of overarching issues meetings. But before I get to that, I just want to make a comment that I think that implicit in the NRC's decision to go forward with the Package Performance Study is a recognition that we are on the verge of a different and new kind of shipping campaign for these materials and that our past experience is not necessarily a perfect guide.

As we all know, approximately 19 times

more shipments will be needed to move waste to Yucca Mountain than have taken place in the past. You know, we currently have experience with about 1.4 million shipment miles. Yucca Mountain could ultimately require 181 million shipment miles. So I think it's a different ball game. I think the NRC recognizes that, and I think that's a good thing.

But in terms of overarching issues based on some of the discussions I've had recently and including this morning, I would like to hear some of the very smart people we have around the table talk about the issue of testing to failure. I think that that is at the heart at some of these cost issues in terms of marginal costs of additional tests. I think it has to do with the difference between testing to failure versus regulatory testing as well as validating the models that we're currently using. So I think that would be a very useful discussion to have.

MR. CAMERON: Is the testing to failure issue, is it all tied up in here with objectives or should it be discussed with discussion of general testing issues? And maybe we should rename this workshop. Because this is the first workshop on overarching issues. So we're going to have plenty of other meetings.

What do you think, Fred? Is that testing to failure part of -- it is all wrapped up in this overarching or is it one of the general testing issues?

MR. DILGER: I think it's a key possibly central testing issue, but I'm not a testingexperts. We have testing experts here and I'd really like to ask them.

MR. CAMERON: Why don't I just put an asterisk there and see where we go. But testing to failure has been raised, discuss it at some point.

Kevin, and then we'll come back to John and then let's go to --

MR. KAMPS: I can mostly wait until we breakout. But I just wanted to make sure that terrorism was under realism and probabilistic risk assessment in that same section there.

MR. CAMERON: Okay. When we get to what is realism, we'll go to that.

John, did you have --

MR. VINCENT: Just a follow-up comment, Chip. After I made my statement about the competing needs of the two kinds of purposes that you had here, you made the statement that we would probably have to select one or the other and proceed down that path. I don't think that's the only option. I think you can probably accomplish both, you may not do it with the same test.

MR. CAMERON: Great. Okay. Thank you for that clarification.

Why don't we get this off. Why don't we affirm this statement, concern of Bob's and everybody I know has this concern. That everything is open at this point.

Now, I guess the question is are there things that would send the message that it's not all open now? I mean, I'm going to go to Bill, the senior manager on this, and let him start talking about it.

MR. BRACH: Let me if I can go back to my opening remarks earlier this morning. I had mentioned, and I felt it was important, and actually repeated it from the standpoint that decisions on our part had been on the Package Performance Study. And that pertains to the cask, the cask selection, the types of test, the test conditions, the test parameters. I restated it twice because I thought it as important. I think it's very important for the dialogue we're having in this workshop in the future as well as comments we receive that we, NRC, are looking too you all to give us your views, comments, perspectives. And this morning I clearly have heard a good spectrum of inputs and comments and want that to continue.

But I will be short and say, yes, affirming the earlier statement that the PPS test protocol are staff's proposals for your and others review comments and suggests, and they're open to consideration on our part and change based on further discussions, deliberations and recommendations.

MR. CAMERON: Okay. I guess that one of the things to ask here is that, obviously, if the NRC hears all the comments from the meetings, written comments, it's conceivable that some part of what's in the draft test protocol remains the same. I would speculate that doesn't equate to the fact that everything is not open at this point.

But, Bob, hearing what Bill said, do you have anymore concerns about this. Is there anything that you think the NRC should not do in this intervening period that would indicate that it's not open and then get some other reactions and I think we can go on from this point?

MR. HALSTEAD: Well, actually, I've been shocked by their candor and openness, and I'll give you the best example.

There have been some statements in the press that I was told were incorrect as an expression of official policy about what the future role of Sandia in this testing is. Now, understand, if someone asked me where's the best place to do full scale testing in the U.S., my first answer would be Sandia. I've got the bias of most of the people who have been involved with this topic for, you know, a couple of decades.

On the other hand, as a matter of credibility, avoiding the perception of conflict of interest, meeting a smell test because millions of dollars are going to be involved, the whole issue of whether a commitment has been made to a particular organization for future work that hasn't yet been specified is an important matter of principle. And I say this not to cause any pain to the people from Sandia, but I specifically, you know, asked that question and I was told that even that issue, because it falls in future fiscal year budget requests, that even that issue was open and subject to discussion.

So, again, I guess I'm trying to validate what I think Bill is saying here and what Amy said very eloquently at the Waste Management Conference last week. And if I'm wrong, you know, straighten me out.

MR. CAMERON: Okay.

MR. HALSTEAD: But I think it adds to the creditability of the overall commitment.

MR. CAMERON: Okay. Thank you.

Let's hear any other comments on this, our issues open at this point and then go onto the next issue.

Lisa, were you commenting on this issue? Go ahead, and then we'll go to Abby.

MS. GUE: Well, related to some of what Bob was just saying, I guess definitely information about how contractors are chosen for this project, fire walls between the contractors, interests in this project and others. For example, Yucca Mountain contracts would be important under that category.

And secondly, I think one issue here that would help is more specific information about where all these comments are going. And I was disappointed to hear that there will be no public comment resolution document issued as part of this. And I think one of the things that we come up against trying to facilitate public engagement in government processes is including the NRC's, is the sense that people are commenting into a black hole.

And so acknowledgement of comments and addressing those comments through a resolution document is something that I hope is still open. And also, just information up front about what the NRC's time line is like between May 30th when we know the comment period and the time when we should start looking in the *Federal Register* for your response.

MR. CAMERON: Okay. So what you're saying is that there's certain things the NRC could do to enhance the fact that everything is open. And some type of more specific or detailed comment resolution, not a separate document necessarily, but some more detailed documentation of how we respond to the comment would enhance the belief that, yes, we're open. Okay.

Go ahead, Andy.

DR. MURPHY: Just to go along with the openness, as we told you this morning was that our plans were to not have a comment resolution document to address the comments and changes -- to make a detailed plan. It's on the table. If you think that it's very important or important at all, you think it ought to be done, tell us so and tell us why and we will consider it.

MR. CAMERON: Okay. And thank you for that, Andy.

Anybody else want to just quickly talk to the issue of a more detailed comment resolution document?

And, Abby, do you want to talk to that and give us your point on this open issue? Go ahead, Abby.

MS. JOHNSON: Yes, I very much agree with what Lisa said, and I think that the pledge of openness is an excellent pledge. But the verification of openness has to come with something more than just the detailed test plan.

If at a minimum the detailed test plan could say this was suggested, we adopted it or this was suggested and we chose not adopt it and here's why; something more formal than that or something more specific. I'm used to the environmental impact statement kind of thing where everybody comments and then there's the justification of we incorporated it or we didn't.

MR. CAMERON: So what you're suggesting is that it doesn't necessarily have to be the most thorough specific comment resolution identifying specific commentors, but it could be something a little bit less detailed than that, I guess.

MS. JOHNSON: Yes. I don't want to turn this into an ordeal for anybody.

MR. CAMERON: Right.

MS. JOHNSON: I just think that there needs to be some sort of accountability here. And so something that says we heard you, or we think we heard you, this is what you said, this is what we responded.

So that everybody's on the record aboutwho said what and what the agency response was is important.

MR. CAMERON: Okay. And did you have anything else?

MS. JOHNSON: No.

MR. CAMERON: Before I go to Rob, I just wanted to tell you that the response by the NRC to this particular suggestion, if you're a response from them, but I just wanted to emphasize again that the NRC staff is here to listen to your comments and to consider your comments. And they'll be very specific questions that come up that we'll respond to or suggestions. But staff is in the listening mode, they're not going to be responding to everything that you hear said around the table. That waits until we sit and evaluate. I just wanted to put that in.

Anything else on the open issue? Charlie, did you have something?

MR. PENNINGTON: Yes, I did. Without beating a dead horse, I do kind of resonate with John Vincent's comments that this testing is not going to serve two masters and it's not going to serve 6 or 7 masters represented around the table here. But I would suggest is that protocols is first document, and I'm pretty confident that most of the comments that are being generated here will not be solved to anyone or maybe everybody's satisfaction here, but rather following the protocols I would expect in concert with normal testing to have a testing plan which may incorporate some of this. And then following that test procedure that I would expect to look at very carefully, and I would expect that there would be due process given, perhaps as we get down into layers of details. So I would hope that if you say everything is open, that that issue is not thoroughly closed out but just the issuance of the final protocol document. There are several other levels of documentation that can be implementation state.

MR. CAMERON: Okay. So openness goes through -- transcends the protocol document.

MR. PENNINGTON: Transcends. Very good.

Bob? Sorry, go ahead.

MR. LEWIS: Actually, that's very similar to one thing I was going to say. The Package Performance Study is kind of the first and the biggest research project that we tried to use this public participatory process on since 1999, and it's kind of been a learning experience for everybody I would say. And, hopefully, some evidence as you move from the handouts in '99 to the Issues Report in 2000, and to the new protocols document, I hope people can see some evidence that we've taken comments and put them into the project.

And I also wanted to in the interest of the topic of openness, talk about how the meeting sites were picked.

MR. CAMERON: Okay. Thank you.

MR. LEWIS: I think it's a similar issue.

We had extensive meetings everyone knows in 1999 and 2000, and those were in Las Vegas, and Pahrump, and also D.C. The D.C. meeting, of course, was picked because of its proximity to all the relevant government offices and the headquarters of all the relevant government offices in many stakeholders, interest groups that are here in D.C. area.

The Nevada meetings were picked not only because of Yucca Mountain, but also because we thought that people there are very interested, we could get a high turnout at the meetings there.

In the interest of continuity, we kept the meeting locations the same in 2000 and again this year.

In addition, this year we added a meeting in Chicago because we had a specific request to add a meeting in Chicago. So we went ahead and did that.

Let me make it clear, there's been no effort to exclude any location from meetings.

As I said it's a learning process. In 1999 or so we thought about having the meeting in Utah. We were having other public meetings in Utah at that time and they were within months of each other. So I believe at the other meetings some Package Performance Study type issues were probably talked about, and there wasn't an effort to exclude them from a specific Package Performance Study meeting, and there still isn't today.

MR. CAMERON: Okay. And just on the Chicago meeting and it's tied to the request, is that that gives an opportunity for all the corridor states that are effected to come to the table. Okay.

Thank you for that.

Now, obviously, that doesn't mean that we shouldn't have or that suggestions won't be made that we should have more meetings in other places. But thank you for providing that.

And then we'll go to the big enchilada issue I guess we'll call it.

Kevin?

MR. KAMPS: And my comment applies as much to relationship to NRC regulations as it does to openness. But it's just on the first page of the executive summary of the PPS.

The PSS is not intended to involve the development of new standards for transportation casks. And I guess it applies as well to what if the model is not correct. So it seems like a basic thing to be open to changing the standards to strengthen them if that's what's called for.

MR. CAMERON: You know, and that's a real good point, and let's get that out on the table and it ties into somewhat of Lisa's point about relationship, NRC, regulatory program, perhaps to Fred Dilger's comment. But you were shaking your head affirmatively when you heard Kevin's comment. Can you response to that so everybody can hear what our thinking is on it?

MR. LEWIS: Sure. I think if we have a situation where we've done the package performance study and however we define success for the test, we didn't achieve that, we'll have a lot of questions to answer. Those questions could involve whether the model was correct, whether the cask design is adequate, whether the regulations themselves are adequate. I think it would be really speculative to try to look at all the different scenarios that could come without knowing the information that the tests produced that we were questioning.

MR. CAMERON: But --

MR. LEWIS: But nevertheless, we would certainly ask those questions if we were surprised by these tests.

MR. CAMERON: Okay.

MR. LEWIS: And take the appropriate action as well.

MR. CAMERON: I think it's important for people to hear that. And when we write the next document, we should keep those types of concerns in mind, I guess, that one of the implications of what Kevin is saying in terms of how we express that.

Okay. John, I'm going to ask you to lead off this. Just briefly this issue is that the test is not necessarily going to be the same to meet the separate objective. And if you could just lay that out and then let's get a discussion going, that might be the simplest way to do it.

MR. VINCENT: Well, I think it's actually pretty simple. It might hinge or I might start the discussion by just talking about real world testing I think which in some respects might be more amenable to public confidence building in that you have circumstance which provides a degree of familiarity with the public at large as opposed to trying to explain the physics of un unyielding surface.

And so having done that, then that leads you to two avenues here to try to look at this. One, in order to satisfy the competing needs is to do something that will accommodate the needs for the scientific data. And beyond that also to do something that will fall into this other category of providing tests that is familiar and provides an input directly into the question of public confidence, whatever elements to ascribe to its definition.

Is that what you were looking for, Chip?

MR. CAMERON: Let me ask you a clarification on that. Obviously what your view is, how you define public confidence, is going to influence what type of test. And, you know, we heard David earlier talk about public awareness. That would be one of his elements of public confidence. And we can go into doing that.

When you say scientific data, I guess can we put a finer point on what you mean by scientific data? Is that the realism confirming further confirmation of models? What do you mean by that?

MR. VINCENT: Well, I think what I really mean by that is the testing that you've decided you need in order to produce data that will allow you to benchmark the models. That's what that whole objective is about. And you might do things there in terms of the nature of the tests that guarantee you get the results, not certain results, but you get results that you can use for benchmarking purposes for the computer codes. And that might not be at all satisfying in the sense of trying to do something that would represent a real world circumstance or a real world circumstance may not allow you as an example to measure the parameters you might want in that circumstance, much less understand, for instance, what the actual impact philosophy was so you can correlate the data with other aspects of the data.

MR. CAMERON: So when you're talking about scientific data, you're really focusing on benchmarking the models and public confidence would be separate, but there would also be the other category of realism? In other words, what you mean here doesn't get you to realism necessarily?

MR. VINCENT: Right. I didn't mean to imply that, as you just said, that public confidence could only be exhibited or influenced by a real world type test scenario. I just said I think there are aspects of that that are easier in terms of trying to explain the situations that will be helpful in that regard, whereas you still need all this particularized types of data that you plan on measuring, accelerations, de-accelerations, velocities, temperatures for the purpose benchmarking. And those kinds of things, you know, you try to explain that even -- and I've tried to do it to my own family, it doesn't work.

MR. CAMERON: Kind of feel sorry for your family. You're at home testing this out on them. I know Halstead does that.

MR. VINCENT: Well, they asked before I responded, otherwise I wouldn't respond.

MR. CAMERON: All right. You know, I think if we can get agreement or discuss these three concepts, then I guess you can go back and say okay, well here's the type of test we need. That leads us into the specifics.

Let me open this up for people to comment on this model, so to speak, that John laid out.

Bob?

MR. HALSTEAD: I want to do something different, Chip. I like, by the way, the way that John clarified the question. I like the way he answered in reference to real world common testing at home, because that's important.

I'm real concerned if we spend this time beating this beating this issue to death that we may not even get through a discussion of general cask testing issues today. And, God, far be it from me to want to cut off the discussion, but I will voluntarily cut off my discussion of what I think are nonessential points. Because I have some real important points like the relative merits of rocket sleds versus drop tests, the relative merits of different types of heat shielding on cables to make sure that the expensive instrumentation that we put inside an expense test article actually produced meaningful data after we've beaten the heck out of that cask and then we put it in a fire.

So, with that said, I'm just going to plead that people focus on their essential issues, and I will promise to do the same.

MR. CAMERON: Well, we can go wherever the group wants to go on this. I guess just from a facilitation perspective, the one thing you need to make sure of is that if you don't do this up front, are you going to have to repeat this discussion all afternoon when we get there?

In other words, what do you need to establish or discuss in order to intelligently talk about those things this afternoon? And whatever you guys, this is your meeting, whatever you want to do we'll do.

MR. HALSTEAD: Ten second follow-up. To me this is the heart of the discussion between full scale testing and scale model testing. And so I'd say this one is now specified to be carried over into the next discussion.

MR. CAMERON: All right. Charlie, what do you have to say?

MR. PENNINGTON: I thought Bob was going to say one thing, and I was ready to say something else. So he --

MR. CAMERON: You looked like you were ready to agree?

MR. PENNINGTON: Well, I do, as a matter of fact, agree with what he said.

MR. CAMERON: Okay.

MR. PENNINGTON: No. I'm simply saying that it is a fairly straight forward exercise to bound the natural environment. I can tell you the compressive strength of the hardest granite, I can tell you the surface conditions, I can tell you the maximum velocities we're going to have. And I think, and this goes back to what I was saying and I think it reverberates with John, that will be important I believe for public confidence but will, as purely laid out in protocols, not be as satisfying to the analyst.

For instance, I would advocate let's have the conveyance, let's use a bounding surface at the appropriate velocity and let's use that as a demonstration and let the analysts do the best damn thing they can to come up with the actual predictive models. Because I think our modeling is in better shape than others do. And I think that was what I would say is the way I wold express what Don is thinking.

If we're going to do this for public confidence building, then let's do realistic tests in which we bound natural phenomena and do it that way. If we're going to do something else, then here's where I would go back and agree with Bob. We can do scale, we can do component full scale; there's a number of ways we can get data to support the analysts. Public confidence will be built in something that resonates with them. I agree, I do not like to explain unyielding curves to a lot of people. My 19 year old daughter, most especial. So it's a tough call, but that's the way I would say it.

MR. CAMERON: All right. Well, maybe with this in mind, this framework, maybe we can move on to general testing issues. I want to check in, though, with Abby who raised the important issue about what are the elements of public confidence. And we've heard a little bit here. Do we want to have Abby, do we want have a little more discussion of that before we go on to general testing issues?

MS. JOHNSON: Well, Chip, I would just suggest that everybody keep it in mind. Clearly, everybody is because they're still talking about it. And just kind of see how it goes.

I think there's a lot of -- I agree with Bob that there's a lot of -- not that this is my forte -- a lot of technical information that needs to be discussed at the meeting.

MR. CAMERON: I didn't know you were an existential philosopher. Okay. Well, that's about where we are with it, I think, but that's good.

All right. There were some process issues raised. We talked about we don't necessarily, you know, maybe we'd talk about Fred's model and TRUPAK process later on this afternoon. We still have this testing to failure issue. I guess what I'm doing is I'm trying to figure out are we ready to move on to general testing issues, as Bob suggests?

All right. And, Bill, let me check in with you before we do that.

MR. SHERMAN: I just wanted to make this comment, and that is in the overarching issue that we're discussing, it appears to me that there is a lot of compromise necessary from the perspective that I've expressed from New England, I think that as much as any an important attribute of this to us is confirming the analytical models. Because we're willing to place a lot of confidence in the analytical model.

On the other hand, we realize that there are elements of the public that want to see the whole thing smashed. And therefore, it's important to do a whole system test rather than just the cask itself. That is a compromise. But then there's another compromise associated with, you know, how fast do real casks go on the roads of the tracks and you want to increase to prove extra.

So I think that all of us around the table maybe should agree that the final product needs to be an element of compromise.

For example, some around the table may wish to see every single cask tested to destruction. I know the hats that I put on, neither do we think that's necessary nor would ratepayers, would we wish to advocate that ratepayers pay for that. So I think that it's important to register the necessity for compromise around the table in the very issue that we're talking about. And then I would add, I think that overall that the proposal is fairly close to hitting the mark for compromise.

MR. CAMERON: Okay. Thank you very much.

And let's keep the need for compromise in mind as we go through our discussions.

Can we go to the general testing issues? Bob, is that what you're suggesting at this point? And do we need Andy to tee that up for us? Or Bob, are you going --

MR. HALSTEAD: Yes, except what time are you doing on your lunch break and all?

MR. CAMERON: What lunch break?

MR. HALSTEAD: Well, I mean, it's fine by me. I'll stay here and drink coffee, you know.

MR. CAMERON: I know. I know.

Yes, it's 12:30. You want to try to do a half hour of general testing issues and break for lunch or do you want to go now?

NRC? Bill, what do you do think?

MR. BRACH: Since this is our place of work, I would rather let the panel offer a comment on their views on continuing now or breaking for lunch.

MR. HALSTEAD: We have it in the budget to buy lunch, Bill, that's what I want to know?

MR. BRACH: That's an easy one. The short answer is no.

MR. CAMERON: Go ahead.

MR. HALSTEAD: Well, I think we better give people a break. Because otherwise when you get to 3:00/3:30, people are going to be pretty unruly.

MR. CAMERON: Unruly. Yes, well that's something to look forward to.

Let me just ask -- okay, Bob, we'll do that. Not that Bob is -- I think people are agreeing with Bob. Bob isn't running the deal, and I don't think he wants to.

Was anybody out here that had a burning issue before we break? Because we said we would go to the audience.

And while you're thinking about that, I just wanted to introduce -- there's plenty of people we could introduce, but NARUC was mentioned, and this is Brian O'Connell. And maybe you just could talk -- could someone talk about it that is behind door number one. Excuse me. Who are you?

PARTICIPANT: Well, most of the people -- Charlie knows me. Charlie knows me. I've worn many hats with the vendors, with vendor companies. But I have a new job right now. I'm manager of business development for the German company called GNSI, Gmb.

MR. CAMERON: Thank you. And it's a compliment to be mistaken for Brian O'Connell.

Brian, do you just want to tell just a little bit about NARUC.

MR. O'CONNELL: Well, NARUC is the Association of Public Utility Regulators in the states. They've been tracking this program ever since a reasonable compact was made that the federal government would dispose of all high level waste and that those who have benefitted, would pay for it. And the ratepayers have been doing their job since 1983 and continue to do so. And we want the federal government to do its part.

MR. CAMERON: Thank you, Brian.

Anybody else? Okay.

Let's go to lunch. And how about quarter to 2:00? Is that okay.

(Whereupon, at 12:35 p.m. the meeting was adjourned, to reconvene this same day at 1:52 p.m.)

A-F-T-E-R-N-O-O-N S-E-S-S-I-O-N

1:52 p.m.

MR. CAMERON: Welcome back from lunch. And I think we really had a great discussion of some of these overarching issues, objectives, how do you define public confidence and now perhaps somewhat belatedly we're going to get into some specifics on general testing issues. Andy Murphy is going to tee that up for us, and I think that there were a couple of things that we heard this morning. What does testing to failure mean? Perhaps the need, as Alan and others brought up, not to put all the eggs in the one test basket, so to speak.

But let's have Andy tee it up and then lets go to all of you for discussion.

And, Bob, if you don't mind when we go for discussion, I'll start off with you, okay? All right.

DR. MURPHY: Okay. What are we going to do? We're going to talk about general testing issues. Well, all I'm going to do is sort of walk through these bullets on the slide to get us thinking again about what are the issues that we have in mind and what do we want to comment in.

I think we've attracted a bunch of attention this morning on the full scale testing question. Obviously, there have been some folks that think we ought to be doing it and think we should have been doing it for a long time. And there's some others that seem to have taken the tact that scale model testing will more than satisfy the requirement.

There's again a little thing about what are the requirements that we're trying to satisfy, but we will not go into that right here.

Question about the types and number of casks to be tested. At this stage the NRC staff has proposed that we look at a Holtec cask, a Holtec rail cask and a GA-4 truck cask to obtain or to satisfy the objectives that we have outlined for the package performance study. I think what I'll suggest at this stage is that this morning we spend a lot of good time talking about the objectives. I think right now we'd like to try to focus on these items as being, okay, fine, this is what the NRC is trying to do. Are these physical tests now the right way to accomplish those objectives.

One of the other questions that came up this morning was the type and number of fuel assemblies that should be included in the test models. At this stage we've proposed that there be a surrogate, at least one surrogate in each of the casts and by a surrogate, we're talking about an assembly that very closely mimics all of the properties of a real assembly, spent fuel assembly except it will be non-radioactive materials.

One of the interesting little topics that got kicked around this morning was the question about test to failure. And for this part of the discussion I'll use failure as being an open pathway to the environment, to the outside of the cask.

The tests that NRC has proposed are not tests to failure. Okay. We are going to challenge the casks both by impact and by fire, but we're not talking about creating a pathway to the environment. They're not tests to failure.

The other thing that came up again this morning, late this morning, is the question about multiple tests. I had very definitely indicated in the discussion of my points that this is a expensive process and that at this stage we're planning on a single test, one for rail and one for task, one impact and one fire for each of them.

And I think in our minds it was probably a little premature to start planning about testing because of the expense and the process involved of getting us to this point. And if we end up with a problem, yes, it's something that maybe we should put on the table to talk about the potential of doing multiple tests. That then flips sort of back to the question of scale because if we're going to doing multiple tests, then maybe we should be doing scale tests rather than full sized tests.

If this hasn't been a thought provocative tee off, I can start over and really bore you. But let's get with the discussion, as Chip has indicated, and talk about some of these points.

MR. CAMERON: Great. Thanks, Andy. Good tee up. I think I've captured most of those issues up here.

And I'd like to discuss these systematically. In other words, let's talk about one issue and then complete a discussion.

MR. HALSTEAD: Why don't you leave the slide up.

MR. CAMERON: All right.

Bob, you want to start us off. Have we heard all that we need to hear about full scale testing at this point or should we start --

MR. HALSTEAD: Well, I need to ask two clarifying questions before I give you some comments on this.

First of all, on this surrogate fuel assembly, I'm curious if you've asked anybody what it's going to cost to procure that and I'm curious other than, you know, handling a LSA source what your reason for using something other than a fresh fuel assembly is other than cost. Because I figure you're probably in the 150,000 to $150,000 range. I haven't checked fresh fuel prices lately. But is that too high, John?

MR. VINCENT: Probably three.

MR. HALSTEAD: Really? Okay. Well, then it's even worse than I thought.

MR. CAMERON: Let's make sure that we -- John, let's make sure we get this discussion on the transcript, okay.

MR. HALSTEAD: That's the nice thing of having good technical people by you.

So, one of the concerns that we have had in the development of our own approaches to testing is controlling the cost of what's inside the cask as a test article. I personally think that your approach, and again I've only had 20 work days to review it, of using properly weighed dummies in a basket or in the cells in the GA-4 is probably acceptable.

I think in the fire test when we're

talking more specifically about this, we might want to talk about heat load if you assume that that's high burn up fuel and what you want to simulate with a heater in there.

And I have some concerns about where you put that real fuel assembly mock up in each of the impact tests.

But that aside, I guess just tell me about this surrogate fuel. What is it going to have in it? Clay pellets or -- I mean --

MR. CAMERON: Can we get an answer to that and then let's go back up to the general testing issues?

MR. HALSTEAD: Well, that is one, Chip. That's a real important one because that's important to understand the whole test article, it's not just the cask, but the internals.

MR. CAMERON: Okay.

DR. MURPHY: We have not decided specifically or proposed at this stage specifically what would be in this surrogate assembly. The surrogate assembly would be physically as close to the real thing as possible or as practical.

The purpose of putting a surrogate assembly in there is to give us an accurate place to place the instrumentation. So that if we place the instrumentation on a pellet, the stress and the strains that we measure out of that are accurately reproduce what's happened so that after we've done fuel experiments we can take those actual stresses and strains measures and understand how the fuel itself would --

MR. HALSTEAD: Okay. Now whether there's a special thermal issue, we'll save that for the first test.

The second thing is I don't know what rail cask types to assume might be offered up depending on where the department's Yucca Mountain proposal goes. But most of the discussion of rail casks is assumed that you'd be testing the rail cask with a welded canister. And that has a whole bunch of issues that I don't want to get side tracked on, but are you considering testing a rail cask that would be like a transport only cask that doesn't have a welded canister?

DR. MURPHY: It could be considered yes.

It would be considered.

We've taken a look at -- because I believe in part we're talking about a cask that has some reasonably likelihood of being used and has been certified, take a look at it. We've got one cask that has an NPC in it, a purpose canister and one that does not. Now this again is to exercise our code, the codes that we have available, both environment.

MR. HALSTEAD: Okay. All right. Well, let me quickly address these issues. Full scale testing, of course, our basic proposal is to test a full scale prototype as part of certification or as part of procurement. And the basic advantage that we see with that package is that: (1) the performance of the package. And in this case, you know, because we're not going to put live fuel in it, you know we're not going to take a radiation test to see if we've got a loss of shielding, but we're basically going to do a pressure test at the end. I assume that's going to be the principle measure in most of the tests as I read them in the protocol, and we've approached that, too.

I don't want to overly complicate this by talking about full scale versus scale model for code benchmarking. I just want to make the case here that from the standpoint of convincing the public that the casks that are being used meet the regulatory requirements for cask performance. I don't think anything will substitute better than actually doing the sequential tests, which is the 9 meter drop, the puncture test, the 30 minute 1475 degree 800 degree C fire test and them an immersion test.

One of the hybrid approaches to that that I'm considering for next week is to defer the immersion test and suggest that the common ground between us is to do the regulatory impact test, the regulatory puncture test and then depending on some code runs, we pick a time for fanning the regulatory fire at 800 degrees C or that we run a slightly hotter fire for a shorter period of time. And then the question is whetherwe pick a failure threshold based on modeling or for the fire test we simply rely on the instruments and run either the regulatory test or a hotter test until we reach some failure threshold that we've specified, in this case probably something like a 750 degree C temperature on the fuel cladding, which is where I think most of us would agree you'd experience first rupture and you would assume that the seals would have failed long before that.

MR. CAMERON: Bob, can I? Let me check in with the group before we go onto the next issue. And it seems like Bob is proposing a variation to the full scale testing that's contemplated by the protocol. And what I want to do is I want to get other people's comments on --

MR. HALSTEAD: Well, could I just do two sentences to tell you where to comment.

First of all, I think that that type of a test would address the public confidence issue that the specific packages being used meet the regulations. Secondly, you would create some benchmark data, and particularly for thermal. But then I'd add on to that and say for addressing the determination of failure thresholds, we could look at it at a number of different approaches.

I personally have never felt that you have to use a full scale model for the impact of puncture tests for extra-regulatory, but of course I do feel that for thermal. I just don't think there's any good basis for scaling it.

So, I guess I'd say this. For regulatory testing you use the full scale and you get the maximum public confidence in addition to having given you the basis of public confidence. You've verified the measured physical data that the cask complies with the performance standards in 10 CFR 71.

Then beyond that, I can see using a full scale cask for thermal for the extra-regulatory part of the test. I think there are problems with these new cask designs if you go smaller than a half scale replica. You know, I'm willing to discuss it, and that's not an inconsequential thing. Because if you use a half scale replica for the rail cask, you're probably saving $4 or $5 million, and that's not to be sneezed at.

I'm sorry. That's what I wanted to say.

MR. CAMERON: Okay. Bob has given us a proposal for a testing regime that includes full scale testing to give us certain results and something less than full scale testing for other results. And he termed it a hybrid. And I know that many of you around the table probably instinctively know or picked up on what he's talking about. Others of us may not know specifically. But with that proposal by Bob, why don't we go to talk about full scale testing.

What do people think about Bob's proposal? And if we need to understand it more, we can ask him about that. Al?

DR. SOLER: Well, I mean, first of all, my personal feeling is that as part of this study having nothing to do with regulatory requirements as they exist, if you really want to do a complete job I think you need three tests.

You need one which encompasses what I'll call realistic conditions, which I think in your words challenges cask. Then I think you need a structural test which gets rid of the impact limiter because if you severely challenge the cask, all you're really doing is highly dependent on your impact limiter. The results date, and by that I mean published in this study, basically say that around 90 miles an hour your impact limiter ceases to function. It's used up its capacity. And if you wanted to push the cask, not the impact limiter, if you wanted to push the cask into a mode where you get significant deformations where you are not running into accuracy problems with your computer code trying to predict these deformations, then you get rid of the impact limiter for this beyond the challenge test and you pick a point. And you deform that cask and then you benchmark your codes against it.

As far as the thermal test, I believe it should also be full scale and it should be performed separately from the mechanical test, simply to avoid problems with instrumentation, failure of instrumentation during the mechanical tests and then running a thermal test.

As far as defining a failure mode, a failure in those two tests beyond challenging, I would not be -- I cannot really define a failure point because I'm more interested defining whether my codes fail, whether my casks fail.

MR. CAMERON: Okay. Thanks, Alan.

DR. MURPHY: Excuse me, Chip. Just one interjection here.

MR. CAMERON: Yes, go ahead.

DR. MURPHY: The calculations that Sandia has done for us indicate that 60 miles an hour impact limiter, it locks up fully. You begin to have a cask test rather than an impact limiter.

DR. SOLER: Yes. So what I'm saying is if you take your quote "second test" in my lingo, you know you don't really need to build another impact limiter, if you will. Because you've already gotten rid of that. Just figure out what test you run to push the cask beyond that. And get really large strains and deformations and things opening up so that you're going after confirming measurable numbers, not millimeters or fractions of inches. Don't try to predict whether a seal lifts off, because if your code is in question then, I mean just the numerical accuracy. Just let it lift off, let it bend in half if that's what it wants to do, and see if you can predict it.

I'm thinking of putting myself in the place of a guy on the street who knows nothing about finite elements or any of these fancy codes. If somebody came to me and said "Look, here's a test," and this cask bent double, if you will. And here's my computer code and it also predicted the cask bent double. Now, wouldn't you now have confidence in that computer code to predict any accident error to postulate?

MR. CAMERON: Okay. We're going to Charlie Pennington. And we've heard two separate ideas, they're different from the test protocol in the same ways. And I'm not sure what the correspondence is between what Bob suggested called a hybrid and what Alan suggested which you need these three tests. But let's keep working this.

Charlie, you heard both of those, what do you say about it?

MR. PENNINGTON: Yes. Let me start back with Bob's original comment, and I would resonate on this fuel assembly issue. And this goes right back to the point we made this morning.

My personal opinion is you're wasting a lot of money testing a fuel assembly in a cask. You can instrument the hell out of that thing and you can drop it separately and you'll know the accelerations from your other testing. So you can test that fuel assembly quite well outside of the cask and get better data.

Now, granted if you're trying to satisfy a public and you want the assembly in there for that, then okay that's a different story. But if you really want your best data and the easiest way to test it, I would submit test that dummy fuel assembly outside the cask. But that's in the eye of the beholder.

Going to Bob's points, I don't agree with all of it, but I think there's a degree of moderation there and modulation that I can go along with. I think I would probably debate a couple of points, but overall I think there's a good rational there.

And Alan's points, Alan I think you've got the heart of an analyst. I don't think that the numbers at the deformations you're talking about are going to make an awful lot of difference. I think when you start talking about stuff that is not only off the bell curve, but off of about three other bell curves, we don't really need that. But, again, if you do -- somebody thinks they really need that, then scale model is the way to get it. There's no sense I think in going for a full scale test to develop that. But, again, what I like about Bob's position is that regulatory standards are really nice because a 30 foot drop makes it nice and convenient combined with an unyielding surface to basically say that's an 80 to 90 mile per hour impact with bounding natural surfaces. That's one of the beauties of a regulatory requirement. And I'm not sure that when you really get to the regulations that are going to be imposed on these transports, dedicated trains, speed limits; even considering terrorist attacks and infrastructure interruptions that might make it worse, I'm not sure that there's much beyond the regulatory considerations. But I do like the concept of the hypotheticals in the regulatory.

Now, you want to go something beyond that for the analyst's sake and for the sake of improving regulatory codes? Fine, scale model will do it. Debate something about the fire test, I think, but hey reasonable people can disagree reasonably. So I think there's some middle ground there that could work.

MR. CAMERON: Okay. Reminding us of Bill Sherman's watchword of compromise.

Lisa?

MS. GUE: First of all, I'm looking for some more information, not necessarily right now, what is the difference in properties between the surrogate assembly being proposed and the dummy assemblies being proposed. And I'm also interested to know, although I appreciate that the fuel testing itself is happening separately, what's the impact on cask performance of the heat that would be generated in a real accident condition from the fuel inside that presumably would not be taken into account in this test conditions if it's cold dummy fuel being used?

And then speaking a little bit to Bob's hybrid proposal, and I spoke earlier about our continued support for full scale physical testing as a condition of cask licensing, I guess first of all I did just want to add onto that that we're not quite as convinced of the beauty of the regulatory standards as Charlie is. And our advocacy for physical tests as a condition of licensing is coupled with concern that the regulations themselves need to be upgraded.

Beyond that, I think definitely full scale tests are necessary. And in part that's because I think the sequential testing is very important and it is likely the case that these different -- these different tests might be scaled differently so that you wouldn't actually be able to use the same scale model in an impact test as a thermal test.

And then finally, in terms of the extra-regulatory test, confirmatory tests, I want to get back to the idea that we didn't discuss this morning but that was up on the list of testing failure points. And I wanted to emphasize again that I think particularly for the thermal test and also the submersion test, I think that information about failure points is really what's most important.

How much have we done either technically or for public confidence, if it is possible to separate those two things, and certainly in terms of public safety if we can give information about what happens at a 90 minute fire when it might be the case that at 92 minutes there's failure?

So that's just a very simple example of why we advocate including looking for more information about cask failure points as one of the main goals of this kind of confirmatory study.

MR. CAMERON: Okay. Thanks, Lisa. And I know you had a couple of questions.

MS. GUE: But I actually just wanted to add one more quick question on there, which is how many kinds of -- in response to the second bullet point up there. How many kinds of transportation casks are currently licensed or expected to be licensed by the time, say, the Yucca Mountain shipments begin? Just as an experiment the other day I called the NRC's Office of Public Affairs with that question and was unable to get an answer. There's no list on the website and I was finally referred by the Public Affairs folks to a DOE database of package availability in general. So I think some information about how many casks are out there from among which the NRC is choosing is at least information that should be provided as part of the study. And, again, we would advocate that if we don't get our first wish of regular physical tests as a condition of licensing, then at the very least every cask model that's to be used in Yucca Mountain shipments should be included in these tests.

MR. CAMERON: Okay. Thank you, Lisa.

I guess thee were three questions posed. What's the difference between a dummy and a surrogate? Is that right? And what's the reaction, is it really a legitimate test if you don't have that heat source in there? And how many casks models or at least number of casks? I'm not sure we can do all of that now, but if we can do some of that, what I'd like to do is ask Bob and Alan and Charlie, and others, you heard Lisa's concern about what type of tests should be done. Is there anything in the hybrid or the pretest or the pretest modified by Charlie in a sense of scale modeling; can you talk to Lisa's concerns from your perspective? Anybody, yes.

MR. PENNINGTON: Yes. I think I could enumerate all the casks for you right now, but I don't think that's going to -- take time.

The testing to failure is getting into an issue that's been raised quite a bit, and I do not agree at all with Andy's definition of failure. I do agree with it in a regulatory sense, certainly, and well before that.

In a regulatory test testing code to standards in which you have at least two orders of magnitude apart, so in a supra regulatory test I do not agree at all that the no cask to the environment is a failure criteria.

So, again, reasonable people would have

to agree on what is failure, and that I don't think we're going to get there today. But I think that failure testing, again, if it comes down to budgets and what's most important in prioritizing, then want to finish up -- and Bob, I think you probably do a bit of this, do at the end some failure testing. If you want to do testing to failure and provided you get a decent definition of failure -- I don't think that that's necessarily a problem. But I think where the real problem comes down to is how do you define failure? Because I've got a really different definition of failure, understanding of what I believe failure than other people. It's a matter of trying to establish what that is.

Now, that was the one point of failure that stuck in my mind. Was there something else that was as important that I didn't get?

MR. CAMERON: Okay. Thanks, Charlie.

Go ahead, Bob. Then we'll go to Bob.

MR. LEWIS: I just want to talk about the types of cask designs that we have certified already. And I noticed in Bob's and Fred's paper on the second page there's a table of all the current recertified cask designs. That table came from a letter, I think, that the NRC wrote to Senator Reed. That's still current as far as I know.

Every year we publish a compilation that includes all the certificates for certified cask designs. And anybody that wants a copy of that NUREG document, just let me know and I'll get you a copy of that.

As far as the number of designs that would be approved by the time Yucca Mountain or any other project comes to light, NRC really doesn't control that because it depends on the number of applications we would get from the vendors of the casks.

And, in addition, we don't have any information on the actual number of casks of each design that are produced. Once we approve the design, the people that own the cask design can make as many of those casks as they'd like.

MR. CAMERON: Okay. Thanks, Bob.

Bob?

MR. HALSTEAD: Yes, let me address a couple of issues.

First, on the types of numbers of casks, I think an important issue for NRC based, obviously, on the input that we give you as stakeholders is to decide exactly what you want to address here. Let me break it down into three groups of casks.

You have, first of all, casks that might be used for shipments to Yucca Mountain. Now most of the assumptions based on the Department of Energy's plans have been that pretty much all the trucks shall be GA-4 or GA-9 new high capacity truck casks. And the assumption has been made that some variety of rail casks will be used. Some may have canistered fuel, some may be transport only. And right therethere are a number of uncertainties.

Now, Charlie, I don't know what your plans are for extending the life of the NAC-LWT, that's an untested cask but it's a work horse. It's been the work horse of the industry. And I certainly can conceive of a lot of shipments being made from the older reactors for another 20 years or so because there are reactors that cannot handle or don't have the setdown space. They may have the crane capacity, but for a number of reasons about 10 or 12 of the older reactors may not be able to handle the GA-4 cask or GA-9 cask.

So even if you're looking at enveloping your choice of cask designs based on what might be used for Yucca Mountain shipments, you may want to consider an existing model cask.

Secondly, if you go with the new cask, I don't know if anybody's ordered one yet, a GA-4 or GA-9, but we've heard different stories about lead time. And, boy, all of them are all long.

Now, this is good for you, Bill, in terms of your budget planning cycle. But it certainly sketches out the schedule here. It may well be, and particularly if we want GA to install thermal couples in that cask to facilitate testing, you may have a considerable time.

So, what I'm saying is the issue of selecting just the truck cask, if you're assuming Yucca Mountain shipments is not in and of itself an easy thing. And while I would probably come down with your staff and your consultants in saying if I had to pick one right now, I would say it would be the GA-4, that's kind of a strawman out there because I haven't had a chance to discuss cost and availability and a bunch of other issues, and maybe NAC will donate a NAC-LWT.

Then I'd raise a question, Charlie, if you do that, then that would raise a question in everybody's mind whether they ought to test that one.

So then the other issue is the PFS facility, and that considerably complicates this. Now, unless something changed, and correct me, John, but you know my understanding is that PFS unless there's an emergency that requires a welded canister being opened, doesn't have any intention of doing any kind of fuel inspection when casks would be received at the proposed facility. Now, that's quite a different proposition than what Nevada thinks will occur at the surface facilities at a repository. And understand that there is great uncertainty, and correct me if I wrong on this, there are several different approaches that may be taken to verifying compliance with the fuel acceptance criteria as fuel is delivered.

I mean, I remember when we endorsed the NPC with welded canisters back in '96, one of the big concerns was well, do you really want to seal that fuel in a welded canister if you're going to take it to the repository and you're going to either open some percentage for spot checking or if you use some truly exotic approach to fuel aging and fuel blending to heat tailor our packages because you've got a hot repository redesign, which is also still uncertain.

So even if PFS in the system, you may be able to predict the type of cask you think would be used from reactors to PFS, and that still might not reflect what happens on shipments from PFS to the repository.

I'm not trying just to punish people. I'm just trying to tell you that seems like a simple issue, like deciding what cask to test if you go to pick representative casks is not an easy issue and it's one of the reasons that we've argued for testing all the ones that will be used for Yucca Mountain.

Now I need to add one thing to my --

MR. CAMERON: You said there three groups?

MR. HALSTEAD: Well, yes. And then you've got the shipments that are being made now. There are some single use casks for DOE shipments from retired reactors. There are some combinations of casks, like a NAC-LWT and an ISO container on a rail car. I mean, there are a number of other things that happen in daily commerce -- not daily, but they probably happen on a monthly basis. And so, again, this is something that we have some ideas and we'll help flush it out, but I think the NRC has to decide here whether your criteria in picking casks if you don't do one of each model, is whether it's based on what's moving now and will move in the next ten years whether there is a PFS re: Yucca Mountain, whether you spec it for Yucca Mountain shipments and/or PFS.

The thing I just want to add to my hybrid that I offered, and thank you, Charlie, for being opened minded. The one down side to us with making that accommodation has to do with what we would like to see in the extra-regulatory thermal tests.

Now, there are a whole lot of arguments about what should happen to the impact limiter and what should happen to the neutron shield. I think if I had my drathers and I was advising the state on where we would come down, if we were in a system where we were assured of having a regulatory test of each of the designs likely to be used, the one full scale test I'd still like to run, Charlie, would be to run the fire test on an undamaged cask. Partly for modeling simplicity, but also partly because there's always some uncertainty about how the impact test is going to effect the instrumentation that you've installed for the fire test. So the cleanest, easiest way to run this, and Dr. MilesGriner, who some of you know whose been both an advisor for this program and the only person I know in the country whose being simultaneously funded thanks to Bill Lake, who is with us today, by both DOE and the state of Nevada to do fire testing, or any type of evaluation, for that matter.

We worked with him on some of the pros and cons of mixing these tests up. And the discussions that Miles had with Kotski, when he was with you guys, and with the Sandia staff suggests that even though it's expensive, the best way to do the extra-regulatory thermal test is to do it without prior damage from an impact.

MR. CAMERON: Okay. Let's try to keep on

this types and number of casks to be tested.

Bob pointed out there are three categories of shipments that are either occurring or might occur and that the NRC should choose it casks to be tested with a mind toward those 3 categories.

Do we have other comments on type and number of casks? Let's go to Ed, and then we'll go across to Bill and come back to Charlie.

Ed?

MR. WILDS: I was just going to comment on the types and numbers and that I disagree that you should choose it based upon what we're using now or what you think we'll go to PFS or Yucca Mountain.

It's my understanding, and correct me if I'm wrong, that we're trying to verify the code here. And so to me if you've chosen a cask somehow that will challenge the code, and that is verified, you don't need to test every other cask. And so to hear that, I guess, you know and looking at other industries and other areas, we don't do 100 percent full scale testing on a lot of other items.

For us in Connecticut, I don't believe I've seen a 100 percent full scale test of one of those subs. We do scale modeling. You know,there's computer codes used. And once those are validated, we feel pretty sure that they're very accurate.

So I have to disagree that we need a test on every canister out there.

MR. HALSTEAD: Just let me clarify. I wasn't saying for the extra-regulatory tests that you had to do every one and I said that I had a proposal to do every one for Yucca Mountain. What I said that I think is significant is that the NRC has to decide what criteria it wants to use in picking the casks. And you've offered a very good one. If the primary objective is code validation, then frankly it may not be that important to look -- but to look, for example, at cask availability and cost and whether there's some representative in that cask, say the rail cask if you think all the rail casks are going to be monolithic, steel casks and you test the steel cask instead of a steel lead steel cask.

But I don't disagree with you, but I just want to make sure that we don't mischaracterize what I've proposed.

MR. CAMERON: The implication of what

you're saying, though, is that for an objection, a different objective than validating codes, that the answer may be -- there may be a different answer?

MR. HALSTEAD: Absolutely.

MR. CAMERON: All right.

Bill?

MR. SHERMAN: Thank you. Bill Sherman, Vermont.

I'd like to address some of the things that Bob Halstead has said, but first I have a question in a different vain.

I notice that the proposed tests only include BWR casks -- I'm sorry, PWR assemblies rather than BWR. Is there a reason that you haven't chosen one as BWR and the other as PWR?

DR. MURPHY: No. Just worked out that way at this stage.

MR. SHERMAN: Would you get more useful information if you used one with a BWR type assembly and the other with PWR, or do you not feel there's any benefit to be achieved that way?

DR. MURPHY: I think in the course of our discussions that we did not fully address that. Off the top of my head, there does not seem to be a significant difference between using one over the other and having be --

MR. SHERMAN: Because you'll get acceleration from data from whatever's there and then you can go and apply that to either type later.

DR. MURPHY: Right, you got it.

MR. SHERMAN: Thank you.

MR. CAMERON: Great. Go ahead, Bill.

MR. SHERMAN: And to address a couple of things that Bob has said, in the spirit of compromise that I mentioned before, it's good to see that Bob came from movement from testing all casks to just the ones that are going to Yucca Mountain. But on the northeast in the northeast and on the northern part -- or in the eastern part of the country there are a lot of casks that go up and down the coast to Savannah River. And it hasn't been necessary to full scale test all those casks, or the ones that go to Idaho across the country. And at the risk of repeating what I've said before, we have confidence in model testing and so the confirmatory aspect of confirming the model tests with the full scale tests are very important for us in our states. And then with that, we don't see the need to do testing of every type of cask.

Now, Alan Soler's suggestion of three tests has validity. And that's one test at reasonable conditions with whole system versus -- and then a second test that maybe is without impact limiters to test for model testing. That's a possibility. But we also see that doing the tests that are proposed can achieve the same goals.

MR. CAMERON: And when you say the "tests as proposed," you mean as proposed in the draft protocol?

MR. SHERMAN: That's correct.

MR. CAMERON: All right.

MR. HALSTEAD: Can I just do a quick response, Chip?

MR. CAMERON: Yes, sure.

MR. HALSTEAD: Bill, one of the things I want to tell you is what we have in mind is what we think would -- if we're doing our best guess of what casks would be used for Yucca Mountain based on what we know today, with and without possibly a PSF in the system, my guess is we would be talking about testing one truck cask, and it would probably be the GA-4. And assuming because of the similarity of the design that it is not necessary to do a GA-4 and a GA-9.

If there were going to be a large number of NAC-LWT shipments, that might be an issue. Some of you know that Ed Bentz has a design proposal for what he calls a shortie cask to service the 12 oldest reactors that have the greatest constraints, so there might be a new design. But that's basically my understanding of NAC-LWT.

But if DOE is able to pull off the mostly rail scenario, which in my opinion will end, if they do, as two-thirds rail and not 95 percent rail, but I would expect the mix of casks that we would go to the mat on to be a GA-4 and 3 or 4 rail casks. And maybe my cost calculation is off, and I know mine's better than NRC's because there's isn't on the table. But we think that you could do that cask testing total in the package for a range of somewhere from $40 to $70 million. Yes, that's a lot of money, but our last lifecycle transportation cost analysis, which I'm sure is low now because it was done between '96 and '98, suggested that the lifecycle transportation cost was going to be $6 to $9 billion including the cost of building a rail spur in Nevada and including some heavy hauls.

So the argument I would make if you're concerned about what Nevada's proposing is this: We see it right now as being pretty much bounded by the types of casks that are in the pipeline that are identified in our paper. And so just to the cost number in perspective, you know we're talking about somewhere in the range of one percent of the total lifecycle, and we did this over 38 years cost of the transportation system. Still a lot of money, but just so you see how we see it as a system.

MR. CAMERON: Okay. I think we'll go to Charlie and Rick, and then maybe unless there is another burning issue here on general testing, move on to impact.

But just in terms of a summary, it seems that in regard to the full scale testing regime, I heard four different -- although I can't say I understand them or the differences -- I heard four different proposals.

One was in the draft protocol, it was the hybrid that Bob Halstead was talking about. Three tests mentioned by Alan. And I guess I would have to include Lisa's full scale testing for licensing as another proposal. And we've heard comments from Charlie, from Ed, from Bill Sherman about these different regime. And I guess some of them or maybe all of them focus on your different objectives; confirmatory, extra-regulatory and public confidence is part of that particular matrix.

And if anybody wants to comment on that summary, do so. But why don't we go to the rest of the cards and we'll get Bill on right now. And then let's go to impact.

Bill?

MR. SHERMAN: I just had a comment. Bob, you're proposing full scale licensing testing, correct? So I think that the number two and four on your thing are the same, I think.

MR. CAMERON: I'm not sure that I heard that.

MR. HALSTEAD: No. Because I think Lisa's also talking about -- understand, Bill, right now the proposal that we have on the table is in the paper. And it says full scale regulatory, which we've costed out, and then it says on top of that find the failure thresholds, validate the regulatory performance standards, some extra-regulatory.

The cost, frankly, it doesn't cost that much to run the fire test out additionally. So if you took what I call our base proposal and wanted to do extra-regulatory, it really doesn't add a lot of dollars to it from a cost standpoint.

And I guess to be really accurate, I would add Nevada based in the Nevada hybrid which I'm going to try to be ready to see whether we're going to present it as an alternative to you next week.

MR. CAMERON: Okay. Great. And I think the difference between what Bob is saying and what is Lisa is saying is Bob is saying that the hybrid would include a test to validate the existing huddles. And Lisa is saying that every time that a cask is to be certified by the NRC, that that cask has to go full scale testing of some type. I think that's the difference.

Let's go to Kevin and Charlie. I know you had your card up for a while. And we'll come to you after we go to Kevin and Rick.

Kevin?

MR. KAMPS: Just trying to bring the realism overarching principle in to some of this, too. On the earlier discussion about surrogate and dummy fuel, one of the concerns that I want to raise is the issue of damaged fuel across the country and in a real world accident how that damaged fuel would behave inside of these packages that we're talking about. So, I would very much encourage NRC to give that all the attention it deserves, given the level of damaged fuel across the country and the deterioration of fuel as time goes on.

MR. CAMERON: Okay. Thank you, Kevin.

Rick?

MR. BOYLE: Thank you. As I said in my introductions this morning, I'm interested in the transport of all radioactive materials. So I apologize right up front that my comment might be a little bit diversionary.

But as we've talked about here as the objective of your study is to benchmark codes, and we seem to be arguing about or discussing -- we wouldn't argue -- extra-regulatory testing, testing to failure, how your models would predict failure, realistic testing and the like, I wonder if -- and I certainly don't pose it right now, but if you were to extend your study, would you consider testing casks other than spent fuel casks with my comment being if you really want to benchmark a code, why don't you test one of the air transport cobalt casks? You'd be at a much higher speed. You'd benchmark your codes much farther out in the envelope. That envelope, I think, coupled with the testing that you're proposing now would allow you to do more analysis on a spent fuel cask to a much worse condition than what's probably being proposed now. So if you benchmarked your codes and, I believe most say those casks would fail, so you'd really see how your codes address failure much higher speeds. You should be able to then analyze spent fuel casks whatever you want, to a much worse case scenario.

And to the people here that have raised cost concerns, my opinion is cobalt costs would be much cheaper and much more available than spent fuel casks.

Thank you.

MR. CAMERON: Okay. Thanks, Rick.

And we've been throwing around three different terms, and I know that they are different or may be different. We've talked about verification, validation and benchmarking. And just be aware that there may be significant differences between the use of those terms.

Charlie?

MR. PENNINGTON: I wanted to respond really to one of Bob's original statements. And I hope I can remember it. But in line of some of the intervening comments, I think I would agree with Bill Sherman almost down the line.

I think there's a substantial case that can be made for "middle of the road approach" he's discussing. And I think that's where I would come closest.

But back to Bob's statement about the need for a new cask for a fire test. With respect to determining heat fluxes, I think there's a number of ways to do that including the one described in the protocols. So if you're trying to come up with a full scale test failure of some sort for a rail cask, or for any cask, there's a very approach here in which you simply model the end of the cask that's at risk, and that's a lid end, with a small full scale full diameter type thing together and you put the impact limiter over it. You use the proper shoulder design and everything else. And you've got a heck of cheaper and you get your demonstration or your fire test to failure, whatever you want to call it. You can do that much more cheaply than building a brand new rail cask. Simply get a scale undamaged fire test.

MR. CAMERON: Okay. Bob, respond?

MR. HALSTEAD: Well, Charlie, I appreciate it. And that's precisely why that part of our testing proposal is purposely left open ended for discussion with others.

Understand, we think it would be a pretty significant thing if we got agreement on regulatory testing for that group of casks we're concerned about. Frankly, that would make it a lot easier to make compromises on all these other more expensive issues, or certainly more complicated extra-regulatory tests.

And, frankly, this gets to one of the

concerns that I have with the proposals that are in the draft protocol and I hope we'll get to talk about them in detail.

The notion that you would instrument the GA-4 cask, subject it to the back breaker and then expect the thermal couples that you had installed to operate properly in, say, a 3 hour regulatory fire? I mean, you can convince maybe, but I go into that skeptical from having looked at instrument performance issues.

So there are a whole lot of reasons why we've suggested a variety of ways to do determination of failure thresholds. But, like I say, I think it's easier to deal with that if you've done the regulatory full scale tests. And the thing I would say to Rick, I mean I appreciate from a cost consciousness standpoint your counter proposal to this, but that's not going to answer the public confidence issue of being able to stand in front of group of justifiably concerned people and tell them that the cask has been physically tested to demonstrate its compliance with the regulations.

Now, there may be a reasons that you

don't want to support that. But I'm saying that's the one advantage that I don't think you get any other way.

And I'll rest my case. Thank you.

MR. CAMERON: Okay. Final comment before we go to impact. Alan, do you have something to say on that?

DR. SOLER: Just a small point. And that is that I've heard some indication that if you test, say, a half scale cask that that somehow going to be cheaper and that that might be a way of accommodating things. I'd like to point out that everybody who has built a cask or who has one that's currently licensed, has all kinds of templates to put this thing together. And if you go in and say now build me a half scale cask, there are all kinds of fabrication issues that can keep the cost the same with no real benefit. And if you take it down too far, while the scaling laws are well know, making a good weld that's one half or one quarter of the size that you've got in a full scale cask is a challenge.

So don't be led to believe that somehow you can do more because you can get more for your money if you build two half scale casks rather than one full scale cask and do testing. It may cost you more in the long run.

MR. CAMERON: Okay. Thank you. Good point. Good point.

Andy, do you want to tell us a little bit about the impact test and we'll get into the specifics of that?

DR. MURPHY: Okay. Before I start talking about the items up there on the viewgraph, I'd like to answer one question and say one thank you.

The first question is that about the surrogate and the dummy. The surrogate fuel assemblies that we're talking about are basically would be indistinguishable from a real assembly except that the fuel would be another -- I'll say another metal rather than actual spent fuel.

The dummy is just simply a box that has the same weight and density distribution as a real assembly. So we're talking about something that's an engineering object in the surrogate and in the dummy, it's a dummy.

The thank you goes to Ed down there for

covering and explaining what we're going to be doing with this validation stuff. That we're looking to validate the codes and the models that areused, we'll be using this experiment, to predict the behavior of these casks. Presuming that we're going to have a successful experiment, i.e., the standards that we're going to accept on the successful predication, our company will then plan on using that code or those codes and those models to predict the behavior of these casks and other casks in similar extra-regulatory -- which I hate that word -- situations.

That's the explanation and the thank you.

The impact tests. We're proposing a speed range of 60 to 90 miles an hour. The 60 miles an hour came from our work with analyzing the impact limiters on the Holtec cask. And we needed to get to at least 60 miles an hour to take the impact limiters out of the experiment, i.e., to use up all of the energy absorbing capacity of the limiters so that above 65 miles an hour basically we've got a cask test on a real specimen, a specimen that looks like one.

The 90 miles an hour came from the realism side of the argument that we in the appendix

A to the protocol report, we explained why and how we looked at the data from 6672 and from the Volpe Center to come up with the frequency with which this kind of accident would occur.

The staff took a look at this and, again, giving some thoughts to the realism aspects of it, we've selected the 75 miles an hour because we felt that based on the calculations, preliminary calculation from Sandia, that we would get a dent or a ding, some deformation of the cask and we would still be maintaining a realism. Our estimates that a little better than back of theenvelop was that this accident speed and the conditions of a near unyielding surface would be about 10 to the minus 7.

The type of impact that we're talking about, Sandia is very definitely famous for its rocket sleds. We looked at that as a potential. I'll say one of the very important criticisms there or the concerns there, or the criteria there was that we wanted to validate these codes. So we're interested in selecting a velocity with which this cask would be impacted. The issue with the rockets is that there is a variability larger than we wanted to see in the speed that you could achieve with that.

And the drop test was decidedly proposed because gravity basically doesn't change. I can say that as a seismologist because I know. But actually the gravity force at the top of the tower is different from the gravity force at the bottom of the tower. Didn't know that, did you? But that difference is insignificant.

The bottom line is we thought we could get a better experiment using the tower than using the rocket sled. And, actually, I like this story. That the rocket sled track as it is set up at Sandia at the moment, the impact end is pointed toward Albuquerque. And the concern was the safety folks would say you got a rocket that you're going to prepare to pull a 140 ton cask down. What happens when it jumps the track and in what direction is it aimed.

The orientation of the cask. There we decide don the center of gravity over the lid corner. And the back breaker because they gave us a level of plastic deformation and they represented radicular challenges to these casks. Radicular challenges to the cask and, obviously particular challenges to the code to predict what happens with those casks.

I'll say with those few comments, let's start over again.

MR. DILGER: Okay. Thank you, Andy.

How about starting at the top with the proposed speed range. Anybody want to start off on that, any violent agreement to disagreement? Bob Halstead?

MR. HALSTEAD: Well, I want to start with a couple of questions, and particularly the cost issue. You say on page 9 of the draft protocols that cost was one of the factors. And by the way, let me say, for a bunch of reasons think the power drop is preferable to the rocket sled mostly because of your ability to control the experiment.

But I was curious about the cost issue. Now, I've had discussions -- boy, this dates me going back to when Marilyn Warrant was at Sandia in mid-February of 1990, as I recall. And in discussions we had with Yosha Mura in '95 and '96 and some, again, discussions we had with the Werks Group at UNR. The bottom line is we got numbers around $8 million plus or minus $2 million to upgrade the drop facilities following the ten to 1 ratio of the target to the test object and some enhancements to the fire pit because of some concerns about the wind cycle and how that would limit your ability to do a fire of more than an hour, an hour and a half, 2 hours.

So is there anything you can enlighten us on the cost assumption that you made about what it costs to build a 3 million pound unyielding target and build a 300 foot drop tower?

MR. CAMERON: Bob, I think I can probably do this, but maybe you should make the connection clear between these issues and the answer to that particular question. Does that have an impact on impact testing, I guess?

MR. HALSTEAD: Yes. I guess what I really would like to know is was your bottom line dollar cost -- what was your bottom line dollar cost for the facility upgrade to do the drop test compared to your estimate for the rocket test?

DR. MURPHY: Right. Our first answer to that is that we made a decision basically on the technical merit. Started off looking at both of them, studied the issues associated with both, technically and safety incidents and decided that the drop facility was the more appropriate way to go.

And I'll say the numbers that you have got are in the right ball park, but I've got to tell you at this stage Sandia is out on bid looking at those costs to let us know collectively what those are going to be.

MR. HALSTEAD: So when you have that test data, it will be part of the discussion that we have within the -- whoever is left at that point if they're in still in public discussion, you're going to bring your costs forward when you have that data?

DR. MURPHY: The answer is yes. Yes. We would --

MR. CAMERON: Andy, make sure you talk into that.

DR. MURPHY: Sorry. I think the answer to that question is yes, that information would be put on the table. The bottom line here again is that I think we want to go back to what we did for the first part of this, and that was to make the decision on what was going to be the best technical test come out of it.

MR. HALSTEAD: And I'm frankly in agreement with that. I'm just trying to build a clean record here, you know. I feel some responsibility along with you guys for proposing that this type of work be done, and I think it's responsible to try and clarify the costs. And I think this also gets us into the whole issue of how you would bifurcate your future decisions about proceeding with the PPS. And, you know, I think at some point you have to decide how you will do our test selection, whether you're going to have some kind of a competitive selection process. You know, in which case putting out your cost data is probably something that a lot of people will be interested in.

I don't want to belabor the point, but I think you do need to understand that a lot of people are going to view this as a very big ticket business decision and they're going to look at your procurement decision on it. So having these costs on the table sooner rather than later, I think makes it a better process for everyone.

And when you say our costs in the ball park, I assume that means that they're not higher than

50 percent of what I've put out. If you can give me any guidance on that, I'd appreciate that.

DR. MURPHY: Like I said, I think you've got in the right ball park at the moment, yes.

MR. HALSTEAD: Okay. That said, we were delighted to see the focus on the drop test. It is true that you can generate a pretty extraordinarily entertaining video with a rocket sled test. But it doesn't give you the technical test on the cask that you get with the drop test, plus your ability to control the test.

This is a very expensive test article. You know, I don't see the rocket imperiling Albuquerque, but I don't want to damage an expensive test article.

I think another way to look at this is to look at the BNFL experience with the operation Smash Hit testing in the early '80s. In my opinion, the reason that that was an effective test was because they did a drop test, lots of simulations and a design revision where they had a very small lid movement leak that was within the regulatory tolerances, but allowed them to argue their commitment to safety by redesigning it anyway. Then, coupled with the locomotive test.

I think if they had just done a locomotive test, that test would not be very compelling. And the danger with going with someone dramatic like the rocket slide in addition to being able to control the experiment and verify that you've actually caused to happen, is this issue of the actual impact that you put on the cask lid. So we find that a strong part of your proposal.

We're still looking at speeds, I'll give you our initial thinking for the rail cask drop.

MR. CAMERON: Don't worry, I just wanted to -- while we've zoned in on drop and rocket, let's see what other people have to say about that and we'll go back to you on the speed issue.

Charlie, on the drop versus rocket?

MR. PENNINGTON: Well, I'm going to go a little different route. Again, as we've said or as I've said, it's my belief that I like the listing of primary purposes that you displayed this morning. I think that I would argue with some of the probabilities you've thrown into the protocol. You've gotten a certain probability for certain velocities, but when you tie that probability in with a probability of an unyielding surface, or so supra regulatory as to be effectively out of any bell shaped curve.

So my own personal preference would be that you're going to do this, and I think 75 miles per hour is a reasonable test. I believe, as I said earlier, that we should bound the conditions with natural conditions that we know the compressive strength of some of our worst granite. And I would say drop it with a conveyance.

And you can rig a test where it can be dropped vertically, as Bob has said, attached to a conveyance on an essentially yielding but still extremely yard, it would be extremely hard for any other object other than a cask. But you can bound it with a natural surface. And that I think has far more -- is far more useful with respect to your first objective, public confidence.

Now, there are other issues and, Bill, you want to do something about better analytical data. But my preference is that one.

MR. CAMERON: And when you say use the phrase conveyance drop? Okay. Is that when we're talking about drop test, is that what we're talking about? No.

DR. MURPHY: We're talking about dropping the cask including its impact limiters in no conveyance, no rail car or anything.

MR. CAMERON: Oh, I see. Conveyance, what conveys that cask. Okay.

MR. PENNINGTON: Beyond regulatory, outside of licensed for --

MR. CAMERON: And let's continue with the drop or rocket, but let's focus on that conveyance drop versus the drop that the NRC wouldcontemplating. And let's go to Bob Fronczak.

MR. FRONCZAK: I guess I disagree with you, respectfully.

I tend to agree with the NRC and Sandia, I guess, and the report in saying that I'd rather see something where you take one variable out of the equation, and I think that was the reason for the unyielding surface. So I do agree with that.

And as far as the rocket sled or drop, I personally and I think AAR believes that the drop test is probably the way to go. I agree with the philosophy in the report on that.

The rocket sled has its attractions from a different viewpoint. And that viewpoint is if you want to assure public confidence, you know, should you perhaps do something like that where it's more realistic. It's more what it would actually look like if it actually happened. But I don't think that would give you that the scientific information that you're looking for and that you could use to extrapolate into, you know, whether this cask would survive a real transportation accident and what type of accident would it take to ultimately potentially fail a cask.

MR. CAMERON: So your distinction, Bob, on not needing a conveyance drop is that you don't need that to get you the scientific data? But if you're talking about public confidence, then the conveyance drop may add more from the public confidence?

MR. FRONCZAK: I go back to the English tests where you have the train going a 100 miles an hour and it crashes into a cask. And they seem to have gotten a lot of credibility out of that test. How much scientific information they got, I don't know. I think they got a lot of that, too. But, you know, does that present a picture perhaps that the public might feel good about? And I'm not the right person to answer that, and I don't know how many people here are, you know, other than as citizens. Ultimately I think you need to do a survey, a national survey.

MR. CAMERON: I think that there are people here who are in touch with the citizenry, if you'd give us opinions on that also.

Let's go to Fred Dilger and then we'll go to Alan.

MR. DILGER: Very quickly, I want to say I agree with Bob Fronczak on this. I think the drop test is certainly the most easily controlled test. We would hate to have to have Sandia do a probabilistic risk assessment of the likelihood of that rocket cartwheeling off into Albuquerque, so we don't want to have that happen.

And as far as the conveyance is concerned, I think the public will have confidence in a really good -- correction. I agree with Bob Fronczak here, again, in this. I'm not in any position to make broad generalizations about what the public will or will not have confidence in. But I will say that the best data, that the best testing program you come up I think will give you the confidence you need far more than good video footage.

So, I think a drop 75 mile an hour drop from a height is probably suitable.

I just want to make one other comment now, and that is for the back breaker test, I'd like to recommend you just buy a highway abutment because that seems to me to be the most likely obstacle that you would face for a truck cask in a back breaker kind of situation. And I see that you had steel sheathed concrete pole as your object on which you were going to conduct the back breaker experience. But I'd recommend you just purchase a standard highway abutment and use that.

MR. CAMERON: So a standard highway abutment.

Maybe this is a good way to check in on the public confidence we talked about. And, Abby, I'm going to ask you about this first. Is that if you understood the conversation about the dropping the conveyance with a cask inside versus outside and you heard Bob and Fred talk about the film and all that, just using this example do you think that doing the conveyance test would increase public confidence in terms of, you know, your understanding of it? You know what I'm asking. I'm just curious to get an opinion on that.

MS. JOHNSON: Well, did it leak? And when did it leak? You can't tell that from video when we're talking about radiation. And so it's sort of a false assumption to assume that, you know -- I was just writing notes here to fear factor cask testing.

You know, the thrills and chills of cask testing is very dramatic, like the British train crash thing. But it really doesn't tell you if it leaked. You can't tell that from looking at the video. And so I think the real challenge is to figure out how to convey to the public whether it leaked or not and if it didn't leak, will they believe you.

MR. CAMERON: So the key to you in terms of public confidence is being able to answer the question did it leak. And I'm not sure that conveyance drop or nonconveyance drop, I don't know how those differ in answering that question about did it leak. All right. Thank you.

Alan, you had a comment.

DR. SOLER: I believe there's a slide somewhere in this package that shows the BFS Velcar. Trying to build a tower that would lift that high enough in the air to drop it, but I can't get over the CG over corner test drop and I got this object that's roughly about times the length of the cask. I would say if you did that, it would only confuse the public and I don't think you would load the cask hardly at all. The Valcar would hit first and it would be horizontal before the cask itself ever felt any.

I'm a firm believer that if you're going to test the cask, test the cask. If you want somehow to test public perception with a good video, then put a cask on a rail car and run a tanker filled with this stuff that was in the Baltimore fire and you can accomplish two things at once and get public perception.

On an instrumented test where you get some real data, don't think you want to drop a rail car with a cask. You want to do exactly what's proposed here. Pick the orientation that most exercises the cask, which is CG over the corner, and decide on an appropriate speed and this looks appropriate for what I'll call a threshold type test. And instrument it.

The simplest test you can propose is the one that's most likely to succeed. The more complicated you make thetest, the more likely you are not to get any data from it.

MR. CAMERON: Okay. Thanks, Alan. That's an interesting perspective on this.

Bob, you were listening to this and you put your card up. What did you have to say?

MR. HALSTEAD: Let me juggle three thoughts.

MR. CAMERON: Well, Bob -- I'm sorry. I was pointing to Bob and then we'll go to you.

MR. HALSTEAD: I'd rather be the caboose here anyway.

MR. FRONCZAK: I just wanted to agree with what Dr Soler just said, you know. And, again, I think you're going to get the most information out of the way the test has been proposed.

And as far as the speed goes, you know the rail industry's imposed a 50 mile an hour speed restriction for spent nuclear fuel. There's a potential to have an opposing train of say, 70 or 80 miles an hour for a total relative speed of 130 miles an hour. Seventy miles at 5 miles an hour is as good as any other speed because, you know, even if two trains hit head on, there's going to be a lot of energy absorbed before that -- any at all. So I agree with the low speed, too.

MR. CAMERON: Okay. And, Bob, I asked you to defer your comments on speed earlier. You might as well give us what you have.

MR. HALSTEAD: Well, I wanted to firm one more time, because I wanted to ask a question about something that's in the protocol document.

In the list of issues that your expert panel reviewed, identified that are a couple of interests. But because of time here, the one that I think is most important is the report said that there was some fairly open discussion of the advantages and disadvantages of doing the drop test with or without an impact limiter.

And can you just -- I mean, I can kind of guess, I think, you know, based on what most of us here have said. But can you summarize for us what the expert panel said and whether there's anything that we should be factoring into our discussion. And then I do want to talk about speeds.

MR. CAMERON: Andy, can you just for the sake of those who aren't experts in this, can you also just tell us what an impact limiter is?

DR. MURPHY: Bob's question is easy to answer. Right now I don't -- yes, I'm sorry.

I'll say Bob's first question is easy to answer. At the moment I don't personally remember exactly what the dialogue with the experts was over the impact limiter.

MR. CAMERON: So Ken remembers, huh?

DR. MURPHY: Ken remembers.

MR. CAMERON: All right.

MR. SORENSON: The main part. The expert panel was really looking at the technical aspects and the technical objectives. And then clearly to do the test without the impact limiters would be much easier analytically than with the impact limiters. But then there's also a lot of discussion that in terms of the realism arguments, that really the test should be done with the impact limiters. And the recommendation that came out at the end of the day by these instructional expert panel was that the test should be done with the impact limiters, but that you should make sure that the full stroke of the limiters is engaged with the test so that you have a sufficient speed that you make sure that you use the entire impact limiter. And actually then impact the cask as well.

MR. HALSTEAD: Yes, that's helpful. So it does essentially address the same thing that Alan was saying.

Yes, I don't like to waffle on points, but I got to tell you this is one that we're still thinking over, the relative merits of impact limiters, no impact limiters coupled with different speeds. And thank goodness we don't have to give you those final comments until May 30th, although I may feel compelled to say something about it next week.

Let's talk about the speeds. I think I agree on the rail speed on this with Bob, and that is

I have never believed that DOE is going to succeed in shipping casks in general freight trains. And if I thought they were going to, I would want the 90 mile an hour impact. Because regrettably we have a few instances of usually run away trains derailing in excess of 90 miles an hour, and I think that's a credible accident.

In spite of my, you know, natural tendency not to try to find any way to moderate these issues, I think the real world issue here is that in a dedicated train transport, your maximum energy transfer between two very big, very heavy casks traveling essentially in the opposite direction impacting one other was probably captured by that 75 mile per hour impact, although we'll also do some thinking about that. So I think that's reasonable.

I must say that I'm not sure we shouldn't consider a sideways impact at that speed. Because I think there are some possibilities where you could have a sideways impact in the 60 to 75 mile per hour range, although I am assuming, Bob, that there will be basically like with P trains, it'll be like a 55 mile per hour limit. And if you have some different assumption, I'd appreciate it if you'd share with it us. But that's kind of the way our thinking has been.

For the highway speed, that's an interesting one. Because if you look at DOE's assumptions in their final EIS, that is if you actually go and look at the highway runs that they did in support of their logistic modeling, you know, they're assuming that these spent fuel trucks are whizzing away on the interstate at 65 miles an hour. Again, I'm not sure that that will be allowed to happen. But for conservatism going with a higher speed rather than a lower speed for the truck impact, even if it is the sideways, presumably jackknife type of impact rather than the head on impact, I think at this point generally we would argue for the higher speed.

And I think the back breaker impact for the truck cask is a very interesting proposal. I don't remember seeing anyone float it before. I believe it goes back to a report that a lot of us have used over the years that Bill Rind did for SAIC at Oak Ridge, probably about 1979 or 1980 when he was primarily talking about the types of accidents that would do the maximum damage to a steel lead steel cask. And I very much appreciate the creativity of the people. You can say, God, creativity in a document like this? I think that that shows some real open mindedness. Again, having only like 20 days to look at this, you know, I need to think about it. But I certainly acknowledge that that is not something that I thought I would see in your test protocol.

MR. CAMERON: Okay. Thank you, Bob.

Let's go to Ray and Kevin, and I think Bob Fronczak wants to say something, and Lisa and Rick. And let's close this out and we'll move to break.

I'll check in with the audience before we go to a break, though.

Ray?

MR. MANLEY: I have a question about the speed. I understand the reasoning on the other side of the table about the 75 miles an hour. But what I don't understand is that if current models simulated indicate that a cask will survive at 90 miles an hour and you're setting up this very expensive experiment. Why wouldn't you just raise it up in next appropriate height to reach the 90 miles an hour to confirm your models? So, I'm a little -- I would go for the 90 miles an hour.

DR. MURPHY: A real quick answer on that. That was one of the concerns about the realism. It was pointed out what is the frequency with which a 90 mile an hour accident is likely to occur. And at this stage, we opted to go with a slightly slower speed with a slightly lower, factor 10 lower probability. No. A slightly higher probability of occurring going from 10 to the minus 8 to 10 to minus 7.

MR. MANLEY: I understand what you're saying, and I can agree in concept except when the accident occurs that's 76 miles an hour. If you've done it at 90, then you've got it 90.

DR. MURPHY: Yes. But also if you've done it correctly at 75, I would presume that you could handle 76, 77 on up to 90.

MR. CAMERON: Okay. Thank you. Thank you, Ray.

Let's go to Kevin, Bob and Lisa and come over to Rick and see where we are.

Kevin?

MR. KAMPS: In terms of the speed, I was

traveling on interstate 80 in Nebraska a couple of summers back and was passed by a -- it wasn't a radiated fuel shipment, but it was a nuclear waste shipment that was going at a pretty good clip. And I was interested because I had my radiation monitor with me and set at a certain level to go off, and it went off and I didn't know what was going on until I was passed by this truck. And he was only next to me for a very short window of time and still was able to set off my radiation monitor. And I couldn't catch up to that guy because of how fast he was going.

So I think the 75 miles per hour may be a little low, actually, compared to what some drivers of nuclear waste in this country seem to be willing to drive at on the highways.

And another issue I wanted to bring up is with the back breaker test, some of the statements that I read in the PPS draft here about how the closure lid bolts would not be impacted by the back breaker tests kind of raised questions in my mind.

The back breaker test seems to be challenging the cask or impacting the cask at its strongest point. So why would you not test the cask at a weaker point, which is at the welds, at the closure point there? Shouldn't there be a test that challenges the closure lid?

MR. CAMERON: Okay. Thanks for the comment on the speed. Is there something that anybody wants to say quickly on the last point that Kevin brought up about the lids versus the middle of the cask?

DR. MURPHY: Right. I've got a quick comment on that. It goes a little bit to the diversity of the experiment.

We're looking specifically at the closure lid with the Holtec test. That will very definitely challenge that area. The back breaker challenges the slide orientation. In there we were responding to some of the comments that we got in developing the Issues Report of seeing an experiment test that bypassed the impact limiters. So that's the -- I'll say the diversity that we're trying to achieve with the two separate tests rather than doing another CG over corner kind of thing on the truck cask.

MR. CAMERON: Go ahead, Kevin.

MR. KAMPS: Then I guess a part of my concern was that, correct me if I'm wrong, but the truck cask had less closure lid bolts than theHoltec cask. So I was concerned that that's not being looked at.

DR. MURPHY: In that particular experiment it's not being challenged the same way that the Holtec rail cask is being challenged. The part that we're out to here was to look at our ability to model these things. If we can model the head end, the lid end of the Holtec correctly and we can model the back breaker of the GA-4 correctly, we're hoping that that will provide an indication to the public, it'll be part of our intent, that we're able to look at the diversity of the models and to come up with accurate predications of what's going to be happening.

MR. CAMERON: Okay. Andy, you may want to talk to Kevin more about that off line to make sure that that information is out there.

Let's take the cards that are up now and let's go to Bob Fronczak. We'll to Lisa and then over to Rick and finish up with Bob Halstead.

Bob?

MR. FRONCZAK: Just a real quick point of clarification for the record. I think, Bob, you mentioned OT55 speed being 55 miles an hour is actually 50 miles an hour. And OT55 is our operating and transportation recommended practice for hazardous materials.

MR. CAMERON: Okay. Thank you, Bob.

Lisa?

MS. GUE: I don't have a specific recommendation about these speeds, but just a comment and a justification for them. And I warned you at the beginning that I was going to be skeptical of the performance, or the probabilistic weighed risk measurements here. And so again I just wanted to let you know that I'm, in a way, less interested in the annual probability of an accident at 75 miles per hour, although that's good information to have as well, than I am to know how does 75 miles per hour compare to the maximum speed limits along potential highway or rail routes for Yucca Mountain and PFS shipments. How does that compare to the potential surface impact speed for a shipment that would fall off of the highest bridge along those routes, for example.

And in connection with that I just want to also flag along a concern that this information is difficult in light of the fact that the Department of Energy has not specified the shipment routes for potentially Yucca Mountain shipments nor do we have that information for private fuel storage shipments either, although at least we know that those would be train shipments.

So, I guess I just wanted to move on and say one quick thing also on this issue of public confidence, since you were asking about a moment ago, Chip.

I think from our perspective as a government watchdog group, what we are really looking for is the information that the NRC is regulating to protect public safety. And there are a lot of indications right now that that may not be the case. And that comes out of NRC's own surveys indicating that only about half of your employees feel that that's the case or feel that it's safe to speak up within the agency. It comes from situation or syndromes, maybe, like Davis-Besse where decisions are made and the NRC agrees in this decision to allow finances to rule over safety. And it comes from the current contacts where we have recent experiences that maybe some of the most real concerns that people have are probably outside that.

We have experience within recent history that may fall outside of that realism bell curve that we've so much about. What was the probability of the September 11th terrorist attacks, of the space shuttle falling out of the sky? Probably fairly low, and those happened. Or the Baltimore train tunnel fires has already mentioned.

So I think what we're really looking for, and as I already mentioned, is information that the NRC knows where the failure points are in the casks that it licenses and that its regulations are appropriate with that information. And so far as the draft protocol has been presented, I'm not really convinced that either of those goals will be met.

MR. CAMERON: Okay. Thank you. Thank you, Lisa.

Rick?

MR. BOYLE: Thank you. I just wanted to

make the comment on the back breaker scenario, and I have to open with an apology to Bob Halstead that as he spoke, the creativity of that scenario was attractive to him. I don't want to come across as a narrow minded regulator; that that creativity is giving me a bit of a problem.

First of all with that scenario, I wonder useful and applicable it is because you've really gone outside the regulatory scheme. As I see it, you're doing a high speed puncture test and it's not preceded by the drop test, which is usually a drop test and a puncture test where now you're doing a very high speed drop test -- or a puncture test, excuse me. The problems with doing that I think will be similar with the problems we've experienced with the normal puncture test, in that the characteristic material and the shape of your punchbar, you're certainly going to use a much bigger than are shown in the regulations. I think defending how you're making that punchbar or how you determined what that punchbar is, you're opening yourself up to a lot of questions as to whether you did that correctly.

In the next case, because of the speeds

involved, we've seen problems with the punchbars used just for regular testing that they don't always stay in place, that they tend to shift a little bit when you do the puncture test. And then also because of the weights and speeds involved, are you truly going to have an unyielding punchbar so that you'll get the results that you want.

And then as far as the orientation, I'd have to leave it to you, but I'd like a little more information as if you're going to do a high speed puncture, is that truly the worst case orientation or could you do more damage in a different orientation.

Most recently we saw that the oblique angle created more of a problem, and that came into the long bar puncture test for fresh fuel packages. So I didn't know if you had considered that possibly an angle or dropping it in a whole different orientation would be more useful.

The next comment is the reality. We've talked a lot about reality. And I don't know how realistic this high speed puncture test at exactly this point, how realistic that is. And given the cost you're going to run into, I wonder if a different test or a different scenario might yield more data or more useful data for the cost you're going to proceed.

The third thing, a little bit, as we run through this since you're in a different regime I think you're going to have an awful lot of people questioning what you were doing and how useful that data is. And then as you explore your code if you're doing a test no one else has ever done, how applicable are your results to a more regulatory framework?

And the last point, it's just a comment. Have you thought because you're in two regimes; you're doing a puncture test on one and a drop test on the other, have you thought about doing a high speed drop on both and then a high speed puncture on both.

Thank you.

MR. CAMERON: Thank you. We really need to quickly wrap here.

MR. HALSTEAD: We're not going to quickly wrap up. This is a very important point.

MR. CAMERON: Before we take a break. Okay. We really do, because we do need to get to the fire. Okay.

Now, you had your card up.

MR. HALSTEAD: I'm glad I had my card up. I think Rick did an excellent job of critiquing the back breaker impact. And before I respond to it, let me say what I appreciate about it, the original proposal.

This particular accident mode, as I said, has a history that goes back at least a couple of decades. And it's important because it is an accident mode that relates primarily to a loss of shielding rather than a loss of containment accident. And that's a type of failure that, frankly, I don't think we paid enough attention to.

You know, I know Charlie doesn't think any of these things are likely to occur. My personal feeling is loss of shielding is more likely to occur or more credible to me than a loss of containment, although we worry about both. And the original analysis that Bill Rind did, again, based on some limited data suggested that with a steel lead steel cask something like an NLI or a NAC, that some significant damage could occur at speeds -- at impact speeds on the sideways midpoint impact in the 20 to

30 mile per hour range, and that's never really been tested and so we -- in full scale, and so that was one reason I thought this was creative.

I have to say that I have to do some thinking about a 60 or 70 mile per hour speed limit. I think that that is certainly something that can occur. And my response to Kevin on this is, that's one hell of a sideways impact. And so if you're looking at something like a worst case loss of shielding accident that probably doesn't involve any loss of containment, this is the kind of incident that, right, then; like I said, thank goodness we got until May 30th to get these comments in.

Now, turn this around. What other impact might you do, although I kind of like Rick's last point. But, you know, maybe it would be interesting to treat this as a puncture test and do it on both casks. And that's one of the things I was going to get at some point here, Chip, was on your schedule was that, you know, impact and immersion aren't really dealt with here.

Suppose you did the traditional drop test on the corner? Where I think there's an advantage there in terms of exploring cask failure is that when you couple that with a fire test you're very concerned in the truck cask because you don't have that neat extra-regulatory barrier which I'd like to fill on the rail cask. Because I think that biases the whole discussion. But you've got bare spent fuel assemblies in there and, you know, it's a seal and a lid that are protecting them from the environment.

So in terms of the combination of accident forces that we've traditionally been most concerned about in a truck accident, the corner drop coupled with a fire test is, you know, clearly the more traditional way to approach the issue of a loss of containment accident.

And I guess that's why I'm glad we have until May 30.

Now going back to the rail, I think Ray raises a really good point. If you're not going to get significant deformation like Alan says, why spend $6 plus million maybe to drop that damn thing? And that is a really good argument.

On the realism side I guess the thing I'd say is that because I was assuming more administrative controls over the rail cars then currently exists, the 75 miles per hour as an opening seems reasonable, though we're going to look at 90. However, I will say I totally disagree with the probabilistic analysis on page A3 paragraphs 2 and 3 where really an incorrect approach to probabilistic bounding occurs. A low ball number of 150 shipments per year is proposed. And a low projected accident rate is proposed. Let's for the record, when you look at DOE's numbers under the 38 year proposal for a mostly rail scenario assuming an average of 3 cars per train, you're talking more like a doubling of the annual number of shipments over that entire period up to about 350 shipments per year. And if you want to do a bounding scenario approach to this, which obviously the authors of this report didn't want to do, but I would recommend, you have the horrific reality that the historically accident rate for spent fuel shipments -- and I hate to throw this out because Bob hates it, it's a limited sample. But the bottom line is you'd have one accident in about 200 shipment miles, and that works out to an accident rate that's about ten times higher than what's the report, somewhere in the neighborhood of 5 per million miles traveled.

So I'm just saying -- I mean, we can get into fighting what your probabilistic basis is for defending 75 versus 90, and I think you need to look at that. And that's one of about a thousand line by line detail comments that I'm sure all of us are going to be writing for May 30th.

But, again, I think Ray's point is good that if you don't get deformation, significant deformation as Alan said, why do it? On the other hand, I think you can make a case for that 75 mile per hour impact because you're assuming that there are going to be administrative controls.

MR. CAMERON: Okay. Good information.

Let me check in with the audience. You've heard a lot of discussion. I'm going to give you a chance to speak.

Please introduce us and give your affiliation.

MS. SUBCO: Eileen Subco, Energy Resources International.

Regarding the discussion of the proposed speed of impact and in reading the proposed test protocols, the discussion that I see missing from it is a correlation between the speed of the impact and the forces involved in the impact. Because it really isn't the speed of impact that's important when we're talking about an unyielding test. As you know, it is what are the forces that are being absorbed by the package.

And an example is NUREG 6672 chapter 5 tables 510 through 513. There's a wonderful real target equivalent velocities where NRC looked at a number of different of types of spent fuel packages and 30 mile an hour, 60 mile an hour, 90 mine an hour, 120 mile an hour without an impact limiter and gave basically the equivalent velocities for impacts with a range of different surfaces. And in transport all surfaces involved in an accident involved in an impact are going to rigid targets. You're going to have a lot of targets that are not rigid and that are going to yield. So you're talking about equivalent impact speeds probably on the order of 150 miles an hour or more for some targets, maybe not that high for other targets.

And I think that in discussing the issue of what's the speed, NRC really needs to explain that because the current regulatory tests, 30 mile an hour impact 30 foot drop onto an unyielding surface, covers much higher impact speeds with a lot of real world targets. And I think that that argument and that discussion is missed and it needs to be part of this. Because the current regulatory tests do cover -- just looking at this -- up to much greater than 150 mile an hour impacts for some packages and some surfaces. And I haven't heard any discussion about that, and I think it's a very important aspect.

MR. CAMERON: Great. Thank you. Thank you, Eileen.

Anybody else in the audience. All right. And introduce yourself.

MR. COLLAR: Yes. I'm Felix Collar with the Nuclear Energy Institute. And just a couple of observations this afternoon.

One thing that I don't find in the report, and it hasn't been brought up in any of the discussion, is looking for contingencies. One of the things you're going to be doing when you're doing these tests, particularly when you're talking about the orientation, center of gravity over the corner and also the back breaker, when you start dropping it from the heights you're dropping it, you're not going to hit it. It's not going to end up like you think it's going to end up.

You know, I know of tests that were done overseas where they dropped from 100 foot and they completely missed the pad. And so when you're going to try and hit this target and stuff, you're going to have some real problem when you're going up to 235 feet. So what you have to do is you have to include some contingencies in there. So if you're not at your angle, if you're 15 degrees and you get 18 degrees or you get 20 degrees, what impact does that have. Because you're going to have to do that beforehand, because if you do it after hand, after the fact, then you start running into questions of credibility and believability from the public.

So that's the first aspect, is to look at the contingencies for your test program and make sure that you can try and -- because Murphy is going to be there; whatever is going to go wrong, is going to go wrong. So you need to make sure you have the contingency.

The second thing I think Mr. Halstead hit on a little bit is that if you look at the designs of these packages, yes, they're for containment but the primary purpose is for radiation shielding. And when you look at the fire test, which you haven't got into yet, lead -- used to be the big issue and we've gone away from that now. So what you have to do thoughis you have to look at the radiation effects after the results of that.

If you have a package that as a result of your drop test you have a 6 inch tear or a 10 inch tear in the side of the stuff but it doesn't really impact your radiation shielding, it still passed the test 100 percent. But people say would you look at that big rip in the side of it. But from the radiation shielding aspect of it, it was not impacted. So therefore, you have to look at the radiation shielding effects as well as content.

MR. CAMERON: Thank you, Felix, affirming that distinction Bob brought up between shielding and containment.

John, real quick and Charlie. And then

we're going to take a break.

MR. VINCENT: I had just had one very simple comment. I think in line with the NRC's efforts to risk inform all of its rulemaking policies and regulations that in fact this process should, to the extent it's possible, be governed by risk informed analysis where it makes sense to do so. And that will include how you do some of the tests, what you do. It goes very specifically to the point that Ed made about if you know what it is before you do it and that's only a little bit, why bother to do it. The same thing applies. It's contrary to what Lisa was saying, but that is a very, very important aspect of all of this.

MR. CAMERON: Okay. Thank you.

Charlie?

MR. PENNINGTON: Yes. Just a follow up.

If anyone has been paying attention, and it seems pretty clear I think that the majority of the voice without almost exception, but really the data acquisition objectives seems to be the higher priority rather than public acceptance. I think that's one thing that I hear.

The other aspect, and I go along with Eileen's comments, that that's a very important aspect that needs to be addressed and I think brought out in public session. But that's another item.

The other item that Bob was mentioning is that back breaker is indeed shielding loss. I see shielding loss as less important to the public than containment. I would offer that there is another event that we should perhaps look at with a long pencil type cask, a truck type cask, you're going to find the slap down G loads on the lid are higher than for the rail cask. The aspect ratio is different so that in fact the highest loads on the lid are going to occur during a slap down event. And so you might look at from a containment perspective the slap down test as opposed to the back breaker.

I think that that may be a reasonable compromise.

MR. CAMERON: So that would be a better test?

MR. PENNINGTON: Well, it depends. I mean, I value containment more shielding. Shielding is going to be a relatively trivial issue from dose, from containment is what the public is worried about. So that may be a way to capture both public and data gathering information.

MR. CAMERON: Okay. Thank you.

And thank you all for this discussion. I think we got some good information out of it.

We're going to come back at around 10 after 4:00. We're going to hear from Chris Bajwa on the Baltimore fire and then Amy Snyder is going to tee up the fire test for us.

We'll still try to get you out of here by 5:30, but at the latest by quarter to 6:00. Thank you.

(Whereupon, at 3:55 p.m. a recess until 43:15 p.m.)

MR. CAMERON: We're going to start with a presentation on a significant event, the Baltimore tunnel fire. And before we get into our discussion, and we'll have questions after that presentation. But let me introduce you to two people that you probably know, but let me introduce them a little bit more fully.

We have Chris Bajwa right here. And Chris is going to do the presentation on the Baltimore tunnel fire. And he's with our Spent Fuel Project Office. He's a thermal engineer there. And he's been with the Commission for about ten years in various activities relating to fire protection, including I take it with nuclear reactor fire protection. And he's responsible for conducting the thermal and containment reviews of spent fuel casks now for certification purposes as well as well as thermal analysis for other types of radioactive material packaging.

He has a bachelor's in mechanical engineering from the Stevens Institute of Technology. And he's a registered professional engineer in the state of Maryland.

And before you go on, Chris, just let me introduce Amy Snyder, whose right over here. And Amy is also in Spent Fuel Project Office. And she is the project manager for Spent Fuel Project Office on the Package Performance Study. She's a relatively new addition to the NRC here since 2000. And besides being project manager on this study, she was also the project manager on the Waste Valley Demonstration project before she came to Spent Fuel Project Office. That's not part of Brach's empire.

But she has considerable experience in the private sector as a health physicist on several decommissioning project. She was an officer in the United States Air Force. Has a bachelor's in geological sciences from the State of University of New York, a master's in management from Leslie College, and also a master's in health physicists from the University of Cincinnati.

And after we're done with Chris, then Amy is going to tee up the fire discussion for us.

Chris?

MR. BAJWA: Thank you.

Well, if you've been with us this entire day, you've probably heard the Baltimore tunnel fire mentioned at least ten times, maybe more. The crowd has thinned out a little bit, but hopefully we'll answer some of the questions that have come up regarding that event.

As many of you know, the event took place in July of 2001. And it generated a lot of interest among the media and probably most all of us here heard about it and were interested by it. And part of that reason was this event, obviously, has some implications when related to this transportation of spent nuclear fuel.

The Spent Fuel Project Office was asked by the Commissioners of the NRC to look at this particular event and assess the events that a fire like the one in the Baltimore tunnel might have on a spent fuel transportation cask.

Next slide.

So what I'd like to do today is tell you a little bit about the Baltimore tunnel fire accident, tell you a little bit about the coordination that we had with the National Transportation Safety Board in investigating this event, talk about a tunnel fire model that was done of the Howard Street Tunnel fire by the National Institutes of Standards and Technology, formerly the Bureau of Standards. I will also tell you a spent fuel transportation cask analytical model where we looked at the effects of this fire on an actual certified spent fuel transportation cask, and a computer model. And then I'll give you some of the staff's conclusions. And hopefully by the end of all that everyone will still be awake. All right.

These are some pictures, and they actually might be a little bit hard to see from the back. But the Baltimore tunnel event, as I said, it occurred in July of 2001. A CSX freight train traveling through the Howard Street Tunnel in downtown Baltimore, Maryland derailed in the tunnel; 11 of the 60 cars that were part of that train derailed. During the derailment a tripropylene tanker car was punctured and that was thought to be the source of the fire.

Now, some of these pictures here, this is the tripropylene tanker car after it was removed from the west portal of the Howard Street Tunnel. This is a picture of the hole that was punched in that car during the derailment. And that's where the fuel, the liquid tripropylene came out. And that hole is about 1.5 inches.

This is the eastern portal of the tunnel during the fire. And this picture down here is the eastern portal of the tunnel taken actually about a year after the fire and you can see the differences there.

What I should say before I go into the National Transportation Safety Board is that the precise duration of the Baltimore tunnel fire is basically unknown. Information provided by emergency response personnel indicates that the most severe portion of the fire lasted approximately 3 hours. We also know that firefighters when they entered the tunnel 12 hours after the hour were able to visualize, actually see the tripropylene tanker car and it was no longer burning. So we know certain that the severest portion of that fire didn't last -- it lasted between 3 and 12 hours and probably likely around 3 hours based on the reports that we have.

The National Transportation Safety Board is the lead investigative agency for major transportation accidents in the United States.

We first met with the NTSB staff that were in charge of investigating this accident September of 2001, and we've had several meetings since with them to discuss the details of the accident.

The derailment was the primary concern for the NTSB considering that the derailment came before the fire. So we, of course, were most interested in the fire. And so we decided that we would go ahead and pursue and investigation of the fire and the NTSB has fully supported that investigation. They provided information, data and technical expertise on rail events, and they also provided access to the actual cars that were in the tunnel during the fire. We were able to examine those and take samples from them to help us in our analysis.

Next slide.

Now, rather than rely solely on the current body of knowledge that exists with regard to cask response to fires, the staff determined that the best course of action would be to better characterize what happened in the Howard Street Tunnel. There was a conjuncture as to what the conditions were in that tunnel, but we really didn't know. We didn't have any solid evidence, at least at the point we started our investigation as to what it was like during that fire.

So we went to the National Institutes of Standards and Technology and we contracted with fire experts there to model the Baltimore Tunnel Fire for us. NIST uses their fire dynamic simulator code in order to model fires. And this code has been extensively in nuclear power plant fires to simulate room fires in nuclear power plants.

So one of the parts of the analysis that NIST did for us, is they validated the FDS code with data from the Memorial Tunnel Fire Test Program. The Memorial Tunnel Fire Test Program was done, sponsored by the Federal Highway Administration, and they did a series of tests in an abandoned highway tunnel, lite a series of fires and collected data from that.

NIST used the FDS to model a couple of those fires and the results that they got were very close to the data that came out of that Memorial Tunnel Test Program. So we were confident that the FDS code could handle a tunnel fire scenario.

Before we go on, the model of the Howard Street Tunnel that was put together was a full three dimension model of the tunnel geometry and it included all the rail cars. So they modeled the entire 1.7 miles of the tunnel and all the rail cars that were in it during the fire.

Next slide.

A little bit more about the model.

Tripropylene was the fuel that fueled the most severe portion of this fire, and that was the fuel source that was used in the NIST model.

There was no ventilation in their model. The Howard Street Tunnel does have a ventilation system, but it was not activated during the time of the fire. So we did not put any ventilation in the model, any forced ventilation.

When the fire model was completed, what they found is that steady state or constant conditions were reached about 30 minutes into the simulation. What that means is that the hot gas layer above the rail cars and surface temperatures of the tunnel wall and the rail car metals reached a relatively constant temperate with 30 minutes into the simulation. That's what I mean by steady state.

The next slide is actually an animation of the tunnel fire model done by NIST. And if we could click on that. I think we need to go a few. Okay.

All right. As you can see here, this is the tripropylene tanker car and this is the pool of tripropylene fuel. The flames are rising very quickly up into the ceiling of the tunnel. And you'll see that the flames are then spreading out along the length of the tunnel.

This tunnel model actually has a slope of 0.8 percent going in this direction; from down here to up here. And that mimics the slope of the tunnel from the west portal to the east portal.

As far as temperatures that we saw in this fire model, within the flaming regions of the fire we saw about 1800 degrees fahrenheit, and that's in the narrow flaming regions of the fire.

Where flames directly impinged on the surface of the tunnel ceiling surface, we saw about 1500 degrees fahrenheit.

We also saw an average in the hot gas layer above the rail cars, in other words up here, of about 900 degrees fahrenheit. And that was an average about 3 rail car lengths along from the fire.

We also had an average tunnel ceiling temperature of 750 degrees fahrenheit along here, about 3 rail car lengths from the fire.

Next slide.

This is a plot to kind of capture what

the temperatures were from the NIST data. As you can see here, just so you don't get thrown off, the scale here is degree celsius and you see that as a maximum up here of a 1,000. That's why you're not seeing the number 1800, which I just said. That's 1800 Fahrenheit.

So you see the upward slope of the tunnel going in this direction. The fire in this case is at distance zero, which about in the middle of the graph. And you can see that up here at ceiling you have the highest temperatures and then the temperatures slowly decrease as you move down from the ceiling. I believe this here is at the top of the rail car. This here is at the bottom of the rail cars. And then you move on down the side of the tunnel, and then down to the bottom of the rail cars. And the floor of the tunnel itself. So that are plots of those temperatures.

And what we did in this plot is we took the maximum temperature at each location and plotted it here. So this is a worse possible or a maximum temperature plot from the NIST tunnel fire model.

Next slide.

Now, not everyone trusts computer models.

And one of the things that we thought would be prudent to do, in fact I think it would be irresponsible if we didn't do, is to look at what was sitting right in front of us, and that was the physical evidence in the tunnel.

Here we had a number of rail cars that had been burned, a number of materials within the tunnel; brick, sand, rails, all had seen a severe fire exposure. So we decided to characterize what kind of temperatures they saw and what duration the fire could have been by looking at the materials that came out of the tunnel.

We went to the Center for Nuclear Waste Regulator Analysis, which is an independent facility out of Southwest Research in San Antonio, Texas. They have material and fire experts that do tests and analysis for all different types of materials and all different types of industries.

What we had them do is come out and inspect the tanker cars, the tripropylene tanker car and other cars that were involved in the tunnel fire. They took samples from those cars, paint samples. They took brick samples from the tunnel. They cut up some of the pieces of the rail car. And they also had, in particular, an air brake valve right off the tripropylene tanker car to look at what happened to those materials during this fire.

They did metallurgical analysis on the samples obtained from those rail cars. And the results that they reported back as far as what those materials saw actually were very consistent with the temperatures reported in the NIST tunnel fire model. So we were confident that the NIST tunnel fire model was characterizing what actually happened fairly well.

Next slide.

The next step for the staff in this was to look at what effect this fire would have on a spent fuel transportation cask. And this is the schematic of the particular transportation cask that we would then model and do the analysis on.

This is the Holtec Hi Star 100, which you've probably heard about today. I think we've talked about it. You've seen pictures of it. This is a diagram of that cask.

As you can see here, this is the multipurpose canister, which is a seal welded canister made out of stainless steel. This particular basket for the model that we put together holds 24 pressurized water reactor fuel assemblies. This particular cask has several layers of steel plates for gamma shielding and then an outer neutron shield as well as a stainless steel skin.

What you don't see in this picture is the impact limiters.

Go to the next slide.

This is a rendering, and I'm sure the gentleman from Holtec will probably recognize this, this is a rendering of the Holtec Hi Star cask on a specially designed rail car. You saw a picture of an actual one earlier today. This particular cask has the impact limiters in place. There's a transport cradle that's mounted to this rail car, and then it has tie down straps there. And that's just to give you kind of a better picture of what it would look like if it was on the rail. And I don't know which mountain range that is back there, but I'm sure I can find that if you want to know.

Anyway, next slide.

This is our model. It's a computer

analysis model. Just to point out some of the features here.

We explicitly modeled all the gaps, the basket here. This is 24 pressurized water reactor assemblies. This is the outer skin of the MPC. And then the gamma plates, gamma shielding plates which are carbon steel. The neutron shield material is within each of these little stainless steel compartments.

This is a two dimension model.

And we also threw in the cradle on which this rail cask would sit when it was being transported.

Next slide.

This is the detail of the fuel assembly area. You can see that we did homogenize the fuel assembly. We did not model individual fuel pins. That usually takes more computer resources than we have to do that kind of a detailed model. However, the fuel homogenization here has been validated with data, so we're pretty confident we're capturing what the fuel is doing.

These are basket supports in the multipurpose canister, and then the multi-purpose canister shell is out here. And you get a sense for the mesh that we used in this analysis model.

Next slide.

So what did we do with this model that we built? We applied the temperature and flow data that we received from the NIST calculation. The NIST calculation using FDS gave us temperature and it also gave us the flow of air around the cask. That's one of the advantages of using a CFD code for modeling fire. You can get the flow that that fire induces when it starts. So we used that data and we applied it to our analysis model.

We did two assessments. The first assessment was of the cask center 20 meters, which is approximately one rail car length from the fire source. And that's per federal regulations. Department of Transportation regulations mandate that any radioactive shipment be separated if it's being done by rail, be separated by at least one rail car from a hazardous material car. So we postulated that if a spent fuel transportation cask was actually being shipped in the Baltimore tunnel in that Howard Street

Tunnel on that train, it would have to be separated by at least one rail car from the tripropylene tanker car that served as the source for this fire.

The second assessment we did was with the cask located adjacent to the fire, about 5 meters from the fire source to the center of the cask.

Next slide.

These are the results from our analysis. The first assessment 20 meters. If you look at this, you have several things going on here. A plot of the fuel temperature, canister shell, cask inner shield, gamma shield and cask outer surface.

In this particular model you can see that the fuel doesn't really start heating up until about 15 hours into the transient. And on this particular graph the fuel exceeds 1058, which is 1058 Fahrenheit which is an acceptance criteria that the NRC uses in thermal review and certification of casks. And I'll talk a little bit more about that in a minute. But it exceeds that acceptance criteria at 116 hours into the transient.

So if you parked this particular spent fuel transportation cask 20 meters from the Baltimore tunnel fire it would take 116 hours at the maximum temperature for it to exceed that fuel criteria, 1058 degrees Fahrenheit.

Next slide.

Obviously, if you move the cask closer to the fire source, you're going to heat up a little quicker. IF you look at this plot here, you'll see that the fuel starts to heat up about 10 hours into the transient and then the fuel actually exceeds the 1058 Fahrenheit criteria at 37 hours past the start of the fire.

Next slide.

We'll play this animation in a second. What I want to make sure I explain is it's important to know that the short term temperature limit is by no means the temperature at which the fuel will fail. This limit was established by experiments that exposed fuel cladding specimens to high temperatures. The exposure of specimens to 1058 do not lead to any noticeable degradation or failure for periods of 30 to 70 days. So it's not as if when we reach 1058 the fuel just falls apart. That's not the case. This is a regulatory limit that we have in place and decided it's our acceptance criteria.

Okay. We have an animation here of the cask model, which I just showed you. When Chet starts it. This 150 hour animation and it's not going to take that long to run.

As you can see, the fire is up here. The highest part of this cask is up here at the top, the ceiling of the tunnel, which makes sense. And as the fire progresses the temperature starts to increase along the sides of the tunnel. And you can see here at the top of the cradle, you'll also see an increase of temperature. And the reason you see that there is we actually took account for the impact limiter and the impact limiter would shield part of the cask from the fire. But there would be flames shooting up over the impact limiters. And that's why the top of this cradle here is starting to heat up.

And you'll notice that there's a relatively cool region down here for the cradle. And that's partially because there's flow of air on the sides of this. So as this fire is starting, it's drawing air into it in order to feed the fire. And so you have an appreciable flow of air across the sides of this things. And then you're heating up basically from the top to the bottom.

Next slide.

So to summarize our results. In this case, the time to exceed the short term fuel temperature of 1058 for 20 meters were over 100 hours, and for 5 meters were over 30 hours.

Now time to canister failure, the seal welded canister which holds the fuel in this case, if that particular canister were to fail you would have a release, most likely. You would have a release. So that's what you're really worried about; what's going to happen in that canister in a severe fire like this?

The time to canister failure at the sustained peak temperatures that we had in this analysis we determined that by doing a stress calculation based on creep rupture of the canister. For 20 meter case, it was over 30 years. And for the 5 meter case it was also over 30 years. So that means that you would have to hold this cask at the maximum temperatures we calculated for this fire for about 30 years before you failed that inner canister that was holding the fuel.

Next slide.

Some of our conclusions. Obviously, the robust nature of this spent fuel transportation cask that we analyzed for this particular event is evidence from the results of this analysis. Based on our analysis, the consequences of a spent fuel cask being involved in a fire such as the one that occurred in the Howard Street Tunnel are minimal. Our conclusion is that there would be no radioactive release. And as a result, the health and safety of the public would have been protected had such an event occurred.

What I want to say also is that a question had been raised previously at other meetings about the shielding, the outer neutron shield being gone after a severe fire event. The cask, when this particular cask was certified, the vendor that did the analysis on that cask in order to get it certified looked at this particular scenario. They assumed that after the fire the neutron shield was gone and the dose rates that they calculated were within the regulatory limits. So the cask was approved based on that. So that question about the neutron shield being gone actually has been assessed already by the cash vendor for certification.

Finally, so where does that lead us? Implications for PPS thermal testing. Maybe that's the question of the day: Where are we now when we take the Baltimore tunnel fire and compare it to what has been proposed in the PPS, Package Performance Study thermal test?

The thermal testing proposed in the Package Performance Study, which includes a fully engulfing fire in which the cask, all the surfaces of the cask are seeing the fire temperatures, depending on the duration that is chosen this PPS performance or this PPS test could provide a greater overall thermal challenge to the spent fuel transportation cask than the exposure that we've analyzed for the Baltimore tunnel fire event. So probably part of the information that feeds into comments should consider the duration of the fire for the PPS test.

Thank you.

MR. CAMERON: Okay. Thank you, Chris.

Now, obviously, that last note at least in terms of this meeting, the implications of this study would be draft test protocol is the key issue in terms of this study for the test protocol.There's obviously other issues, and Amy is going to introduce that for us.

But before we get into that, are there questions to Chris about this particular study. And let's go to Bob Halstead first and then we'll go to Kevin.

Bob?

MR. HALSTEAD: Chip, I want to make some quick comments on the Baltimore fire analysis by NIST and Chris' presentation. I'll keep them very brief because of the hour, and also because some of you may know the two people who worked on this analysis for the state of Nevada. Dr. MeritBurkey, who is formerly the chief fire investigator for the NTSB had to leave and has, in fact, been hired back by NTSB because they decided they couldn't figure out what really happened in the tunnel without him. So we'll actually be operating, unfortunately, under a conflict of interest provision in the NTSB's contract. So I will be responsible, obviously, for these comments, but I want to recognize the fact that I learned a great deal about doing this fire analysis from Dr. Burkey.

And Marvin Reznikoff, who was one of the people who worked on the fire consequence analysis for us may or may not be available at the Chicago meeting on March 19th.

And so we do intend to file some comments on the NIST report as part of our PPS comments that are due on May 30th.

Point number one, with all due respect to Chris, we would like to see the authors, the NIST authors of the report brought to a meeting so we can discuss this report with them.

We had a terrible experience over this particular project, and I won't repeat all the details, but they basically had a very undermining impact on our ability to work with NRC. We first requested that our experts be allowed to sit in with the early discussions between NRS staff and their various contractors. We then asked for early access to the information. As you can see on the title page of the report, the manuscript was apparently completed in August and not released until February. We spent a fair amount of money, close to $2,000, on FOIA photocopying without getting much information to inform our preparation for this meeting.

And so I don't know how we completely avoid these problems in the future. Because, as you know, there's a larger issue of what right Nevada consultants and staff have to be present in certain types of NRC meetings. And we're still researching the legal ramifications. But the long and short of it is the best way now to resolve it is to bring the NIST report authors to the table and let them speak for themselves.

Point number two, we believe the most important point for testing is to ask an answer the question what's the worst case fire that could have occurred in the Howard Street Tunnel. And our original position two months after the fire was 24 hours or so at over 500 degrees Fahrenheit, probably 12 or more hours at about 800 degrees C or 1500 degrees Fahrenheit. And we still think that that was a reasonable assumption on the NIST report.

Point number three, for testing the second most in question is what is the most vulnerable NRC certified cask and fuel configuration that could have been present in that fire? WE've looked at some performance envelop analysis that Miles Griner did under contract to DOE, and we find some compelling reasons that in fact the Westinghouse design MPC with a welded canister might have failed under those fire conditions, but certainly analysis suggests that a traditional steel lead steel transport cask without that additional extra-regulatory barrier of the welded canister is a big issue.

And I appreciate the sensitive and self-effacing way that Chris dealt with this. You know, it's clear we've got a situation here where two different parties evaluated this fire using different sets of assumptions and both stand by their findings. And is so often the case in these kinds of disputes, you know, the question is in the assumptions.

Point number four, the key fire condition at issue that we want to remember is this: The NIST finding of constraint in that fire is the intrusion of water from the water main. Now one of the reasons as I understand it that Dr. Burkey has been called back now as a retired consultant to NTSB is because they're reconsidering that issue. And I don't think -- is Dr. Burkey still here? Did he have to go?

Okay. I'm sorry because of the time of the day. And certainly he can speak for himself.

But this, as I understand it, one of the issues that he'll be working for NSTB on.

Point number five, there are a number of key issues in the fire methodology. To mention them briefly, there are reasons to question the assumption that steady state is reached in 30 minutes. Questions about the tunnel simulation that was run. Perhaps it should have been run for a period of 3 hours. There are some questions about whether the NIST analysis as we read it included -- and we read it did not include the re-radiation of the heat absorbed by the thick brick wall of the tunnel. And moreover, we think it's credible to assume that the cask lid, because of the whole business with no requirement for dedicated trains and no requirement for properly designed buffer cars, that when you do the analysis it's perfectly appropriate to assume that the lid end of the rail cask would have been within that 5 meter zone, the hottest part of the fire.

Finally, we read the NIST report conclusions on page 28, and we find nothing in the report that disputes our original conclusion that the fire we're concerned with could have burned for up to 12 hours at 800 degrees C or 1500 degrees Fahrenheit. And we find the further added conclusion that the fire could well have burned for 3 hours at a 1000 degrees C or 1800 degrees Fahrenheit as, you know, a portion within the longer fire. And that that's a pretty significant fire event, and we continue to believe that it's an appropriate example to use as we try and look at real world fires that would inform the extra-regulatory condition that we'd like to look at in the PPS.

And I apologize for the length of time. Thank you.

MR. CAMERON: Okay. Well, thank you for being concise on that, Bob. And I think the question is going to be when we look at the draft, discuss the draft test protocol how either NIST finding or the Nevada finding should be factored into that test protocol.

Chris?

MR. BAJWA: Yes. I just have a few things I'd like to say, and I'll make those comments brief.

Just sort of to respond to some of the things that Bob has said.

First of all, Bob, I completely agree that one of the -- probably the best ways for us to go forward is to sit down and talk about the analysis that was done, some of your objections to the assumptions and the conclusions and to really go through this. Both NIST and the individuals at the Pacific Northwest National Labs who assisted us with the thermal analysis are fully willing to do that. So I think that we should discuss those things in that kind of a forum. I think that we could get a lot of good discussion and information exchange in that forum.

The other thing I'd like to say, two things actually. We actually did run an additional case of a 7 hour fire. We modeled a 7 hour fire. NIST did, not we, but NIST did. They modeled a7 hour fire with a 23 hour cool down and then additional 100 or so hours. And we looked at the 20 meter case. We reran our analysis of the cask and we didn't see any problems with that. We didn't see any difference performance.

So we did run an extended fire case of 7 hours and we didn't see any problem with that.

Now, just to set the record straight here. A 12 hour fire at 1500 degrees Fahrenheit would have been impossible in the Howard Street Tunnel. And the reason I saw that is because there was not enough fuel in that entire tunnel to burn for that length of time at 1500 degrees Fahrenheit.

If you take the 28,000 gallons that were in that tripropylene tanker and you burned it in a controlled pool fire burn, you're talking about maybe 7 or 8 hours.

MR. HALSTEAD: Well, I appreciate that. And what I'd say in response why we want to have the NIST people and our consultants here is their argument is, Chris, is that there are some uncertainty beyond that. I think we're arguing about a period between 7 and 12 hours based on the re-radiation of heat and also the fact that there were other flammables present in the tunnel, which certainly had a much lower burn temperature but may have contributed to this.

Nonetheless, I want to say I appreciate the professionalism and the elegance of your analysis.

I'm disturbed by the fact that there are other analyses, in particular the work that Griner did, extensive work under that projects that Bill Lake designed which developed some performance envelop analyses that we think point in another direction. And the only thing I'm angry about is the procedural business of us having to wait so long to get the available information.

I have great respect for the analysis that you've done. And I also think it's possible that doing these side-by-side analyses on different cask configuration, we may come to a point that Nevada raised to everyone's attention and then it got lost in '96 after someone in the industry had the bright idea of precluding the Department of Energy from spending money developing a multi-purpose canister, which was one of their better ideas. And that is the issue that since the welded canister does seem to provide very significant protection, there's an issue here as to whether we ought not to address that as a regulatory issues and have that on the table as part of the protection that the package provides in a severe fire environment.

But I very much appreciate the way that you've handled this whole issue.

Thank you very much.

MR. CAMERON: Okay. Thank you both.

We're going to go to Kevin and then Fred Dilger and have Amy tee it up for us.

Kevin?

MR. KAMPS: Chris, I just had a couple of questions. Did I understand correctly when you said that the neutron shielding even if lost on theHoltec would still only result in below regulatory doses?

MR. BAJWA: For accident conditions. For the hypothetical accident fire the doses that are allowed by regulations, this particular design would have stayed under those dose for the accident conditions.

MR. KAMPS: Okay. Do you know what the dose rate? Is that 5 rem? I'm not sure what dose rate you're referring to.

MR. BAJWA: I don't know exactly.

MR. HALSTEAD: One rem at one meter.

MR. BAJWA: One rem at one meter. Okay. Yes.

MR. KAMPS: Another question I have is there are -- that was what you analyzed was the fire that happened in the Baltimore tunnel fire. But a point I wanted to make was that there are lots of hazardous inflammable materials on the roads and on the rails that burn at much hotter temperature. And Bob Halstead made some points that I was going to bring up as well about other nuclear waste transportation containers that might not have fared so well. And one of our big concerns was the emergency response that actually took place at the Baltimore train tunnel fire where according to some press accounts the firefighters rushed into that scene unnecessarily, given the circumstances, perhaps. Although there was the concern that, you know, toxic materials could be released and that's a concern with nuclear waste transportation as well if firefighters do stand off in a fire situation, what if the fire reaches the container and radiation is released. Maybe they should intervene.

But the loss of the radiation shielding and its impact on the firefighters is a big concern that we have that I think is getting lost, especially given how they did respond to this specific accident.

MR. CAMERON: All right. Thank you, Kevin. And hopefully we can factor all this into the test protocol.

Let's go to Fred and then Bob, and Charlie.

Fred?

MR. DILGER: As so often happens, Bob Halstead stole a lot of my thunder here. But I just want to highlight, that speaking as someone who kind of watched on the periphery as the controversy between these two studies developed, I think that the very useful result of these two studies is that we're going to be able to get a very -- say with a very degree of confidence, I think, about what the contributions to safety the canister made in this incident. And I think Bob is exactly right when he says that this might point the way to certain regulatory action on the part of the NRC, and certainly some activity on the part of the Department of Energy as it develops its transportation program for Yucca Mountain.

I think that getting the sets of analysts together to talk about what the contribution to safety provided by the canister was is extremely useful and helpful. And it's something to consider for the future.

MR. CAMERON: Thank you, Fred.

Bob?

MR. FRONCZAK: Just really quickly, Bob. He mentioned, just kind of breezed through dedicated trains, but to point out that tripropylene car would never have been in that train or in that tunnel if that would have been transported in a dedicated train or a spent fuel had been transported in a dedicated train.

MR. CAMERON: Okay. Thanks for that clarification, Bob.

Let's go to Charlie and then over to Lisa. Charlie?

MR. PENNINGTON: Just a couple of points. The neutron shielding will be assumed to go away in these fire accidents, but that's because it's convenient, a convenient mechanism for doing a conservative analysis of the number of tests involving burn of this material that will allow us to draw some pretty good conclusions about how this stuff survives.

It has pretty good burn characteristics. But even in a charred condition, it displays a lot of the characteristics that it has intact.

The second issue I would just like to ask for personal information from the Department of Transportation. Is a similar session such as this going on for tripropylene tank cars?

Okay. Thank you.

MR. CAMERON: Right. Lisa?

MS. GUE: This is the second time I've seen this presentation and the second time that I'll make this comment. Just to pick on the conclusion on page 19 where it's written that the fire would not result in radioactive release. And you know one rem at one meter is not zero. And I think just to echo what's already been said very briefly, that it is important to look at the impact on radiation shielding in these studies and to communicate clearly what the assumptions are. And therefore, the relevance of the conclusions.

I think this is at the end of the day a misleading statement on the page 19 conclusion.

MR. CAMERON: Okay. Thank you.

And let's have Chris come up to the table for the fire discussion since comments like Lisa's and others may factor into this.

And I think Charlie still has his card up. Oh, Ray. Well, let's hear from the man from Baltimore, I guess, before we start.

MR. MANLEY: Thanks a lot.

I'm speaking probably a little bit from ignorance here, but what is the possibility of having two car involved? I mean, we're talking about burning time, one car lasting so long. The possibility of two cars being involved at the same time.

MR. CAMERON: Now you're talking about two cars of the tripropylene?

Bob?

MR. FRONCZAK: I mean, there's a possibility of that, 3 cars, 4 cars, 5 cars. I mean, the probability gets smaller, you know. But there's a possibility. Probably LP gas would be a higher probability of having multiple cars together. So there's a very real possibility. But, again, if the spent nuclear fuel was in a dedicated train, none of that material would be in it.

MR. CAMERON: Right.

MR. MANLEY: I understand that. And, again, I realize we're looking at realism as opposed-- real life as opposed to. But you also have to look at what is the worst case possible scenario.

I mean this particular chemical, as you indicated, are there other chemicals that become involve that would create a more hazardous condition?

MR. CAMERON: Okay. Thanks.

We really need to get into Amy's presentation now.

Kevin, real quickly?

MR. KAMPS: Yes, just a quick follow up.

This whole issue of dedicated trains and mixed freight, it just gets back to the whole what's most important. And saving money for the Department of Energy or for the nuclear industry in mixing these hazardous chemicals, explosive and such things. It gets back to the same dynamic of Davis-Besse. It's about saving money at what risk, that's the question.

MR. CAMERON: Okay. John, Bob and then we'll go on.

MR. VINCENT: Very quickly. NEI has just

recently published a transport policy which includes the use of dedicated trains when you've decided you're going to use rail.

MR. CAMERON: Well, I guess that makes sense.

Bob?

MR. FRONCZAK: A real quick response to your comment, and I said it I think earlier or I attempted to say it the first statement today. What I think we need to do is we need to understand ultimately, you know, what sorts of incidents, real world incidents might lead to a cask failure, how long it might take to reach that and try to either mitigate that from occurring or be able to respond to the result.

MR. CAMERON: Okay. And with that is a nice seque into perhaps -- Amy, could you talk to us a little bit about the fire aspects and then we'll have a discussion?

MS. SNYDER: Good afternoon. I'm Amy Snyder.

NRC appreciates your participation in this workshop, and I am glad to have this opportunity to discuss with you the fire testing protocols this afternoon.

We just finished a discussion of what we learned about the Baltimore tunnel fire and how it compares to the Package Performance Study test protocols. As significant and severe as the Baltimore tunnel fire was, it was not a fully engulfing fire. The fire conditions were not as severe as compared to the regulatory fire.

We saw this morning in Mr. Sorenson's presentation that we plan on performing calorimeter testing, testing that is necessary to obtain background data such as temperature and flux that will be used to benchmark the code that we plan on using to more accurately model the fire environment.

Then we are going to do modeling to determine the response of the cask to the fire environment. We'll make predictions.

Then we'll do the physical testing and compare the results.

Now I want to review with you the staff's proposal for the fire test. The staff is proposing full scale testing. This is one of the things that we have learned that through the public meetings in 1999 and 2000 that was something that the public wanted, full scale testing. We actually planning on doing physical testing conducted on real certified casks.

Second, the staff believes that the staff should be a fully engulfing optically dense hydrocarbon fuel as. As Dr. Murphy described to us this morning, that means the fire surrounds, completely surrounds the cask. You cannot see through the fire and the fuel source is hydrocarbon or jet fuel in the test protocol.

And thirdly, the staff proposes to conduct the fire test for more than 30 minutes. The duration of the fire has not yet been determined, but that's open for discussion.

Next slide, please.

There are many ways in which fire testing can be conducted. We would like to know what you think about these two questions and we value your input.

And we also anticipate that your comments could result in worthwhile changes to the underlying test approaches and plans.

The fire test modeling in the test protocols report examine changes in temperature in the heat flux modeled from zero to 60 minutes. However, no specific duration for the fire testing has been proposed yet by the staff. But the staff suggests more than 30 minutes.

You saw from Mr. Sorenson's presentation this morning that there are three different positions that were models. The casks were preliminarily modeled with cask on the ground, cask one meter above the fire and the cask positioned above the vapor dome. What should the position of the cask be relative to the fire for the fire test?

Next slide, please.

Your comments, concerns, ideas and suggestions are welcome and we will consider all your comments.

Thank you.

MR. CAMERON: Okay. Thank you very much, Amy. And it is getting late. Amy's put some questions before us. You've seen what's in the draft test protocol already. I guess I would look for what your opinion is of what's in there and do you have any ideas on these other issues. And let's go to Bob Halstead.

Bob?

MR. HALSTEAD: Thank you, Chip.

As I said earlier, we have done some work with Dr. Miles Griner at the University of Nevada, Reno, regarding both the logistics of extra-regulatory fire tests and the costs and some of the issues involved with modeling those tests. And so I'd just like to make a couple of comments, and I will talk about some specific temperature and position issues.

One of the things that I am convinced of from Miles' work is that this is an area where in constructing a good full scale test, you're probably going to spend a fair amount of money doing simulations to develop your target failure threshold. That's really for us the issue here. I'm going to speak strictly about extra-regulatory testing.

Secondly, there are some concerns about the limitations at specific facilities, and there are some issues about the relative value of a fire test pit versus a furnace test.

And thirdly, as far as actually

specifying the peak temperature and duration engulfing fire, and understand there are some interesting issues related to cask impingement on the edge of a wind driven fire that aren't addressed here, and also some issues involved in torch fires which I think a lot of us have a greater appreciation of as a result of the conditions that occurred in the Wisconsin propane derailment accident a few years ago. But if we just look at the engulfing fire, which is traditionally how we've approached this issue, we're considering three different approaches. And, frankly, we're going to need to have some help from the NRC staff. We're going to have to find a way to do it on our own short term in modeling the failure thresholds.

The first way we would approach this is to take the performance envelop analyses that Griner developed for DOE for the engulfing regulatory fire, 800 degrees C, 1500 Fahrenheit. And there for the truck cask you're probably looking at fairly short duration for an intact cask, somewhere between 30 minutes and a couple of hours of maybe as high as 6 hours. For the rail cask we're looking somewhere in the area of 6 to 12 hours.

And, again, all of these are just as the NRC staff has said in their proposal, these are just the options that we're looking at now that we have the draft protocols in hand.

The second thing that we're looking at is modeling a failure threshold for a hotter fire, somewhere in the range of 1000 degrees C to 1200 degrees C. And, again, model a failure threshold -- and I must tell you I knew this number this morning but I'm too tired to remember it and too tired to find the notes. So you'll just have to trust me that there are some curves here that are of value.

And by the way, I note, Ken, that somehow I neglected to send you the study that Miles did for us when were sending documents. And I want to take this opportunity to acknowledge the way that Sandia has done a good job of making transcripts available and reports available, and I'll make that available.

Now the third area where we really don't have a lot of guidance is simply to take an undamaged cask and properly instrument it and run either the regulatory fire, 1475 degree Fahrenheit or some extra-regulatory temperature threshold and instrument the cask for readings, one that would represent the fuel cladding temperature, one that would represent the temperature in the seal region and one on the surface of the cask. And simply run a fire until our instruments told us that we had reached some predefined threshold.

Now, until I talked to Charlie a few minutes ago, I thought 750 degrees C on the fuel cladding was probably a number most people would agree would lead to catastrophic burst rupture, is a pretty good target. So Charlie said well maybe you should look at that. You've got to look at some different numbers for the gap inventory of cesium and rethink what you want to prove. And I'm opened minded and we're going to look at that.

But basically those are three approaches that we've looked at. And I think it will be useful when we send the report that Miles Griner did and add that to the literature that's available.

MR. CAMERON: Okay. Thank you, Bob. Bob, once again, has given us a comprehensive suggested approach on this. And I would ask others around the table to not only think about what's in the NRC draft protocol, but also what Bob suggested.

Kevin?

MR. KAMPS: Yes. I mentioned earlier today the misuse of films from earlier Sandia tests to lobby in favor of legislation and such on Capitol Hill. So my question is what is this about the optically dense layer and what's the significance of that? And is it just for public relations purposes to have an engulfing fire to impress the public with?

MR. CAMERON: Okay. The technical basis for optically dense fully engulfing. Chris?

MR. BAJWA: Actually, optically dense really has nothing to do with public relations. What it means is think about this: If you were on the inside of that fire and you couldn't see out, it means that all you're seeing is the flame of that fire. And think of it this way. The cask is in that fire and it can't see out. So all it's seeing is fire. There are no gaps. And so the full brunt of the flames that are around that cask are putting heat into it. That's what we mean by optically dense.

MR. KAMPS: And will these tests be filmed?

MR. BAJWA: I don't know. I guess they would be.

DR. MURPHY: Definitely.

MR. KAMPS: What will the uses be of the films?

DR. MURPHY: Public confidence in addition to documenting what has happened with the test.

MR. CAMERON: All right. Bill Sherman and then Lisa.

Bill?

MR. SHERMAN: I have a question, and that is in the report even though your slide is saying a duration greater than 30 minutes, not that slide but your slide, a duration greater than 30 reports. Your report is a dummy amount of one hour. And you indicated on page 53 that that represents 82 percent of all train fire accidents.

Have you translated that into a probabilistic number like you did the 75 miles per hour for the impacttest. 75 miles per hour I believe you said earlier was ten to the minus 7. So have you converted the one hour fire duration into a probability?

DR. MURPHY: No, we have not at this time.

MR. SHERMAN: But could easily?

DR. MURPHY: Yes, it could be done.

MR. SHERMAN: And so it's too bad that you don't have that, because I'd like to compare what the one hour compares with probabilistically with the 75 miles per hour probabilistically. I suspect that the one hour is a lot less, less or greater. You have trouble when you start talking to ten to the minus. But my sense, and I didn't state this before, is that my sense is that the 75 miles per hour is high but a reasonable compromise based on the test -- the results that you want to get. It would be interesting to compare a fire duration probabilistically.

DR. MURPHY: Very definitely. The appendix A to the report, test protocol report, was intended to indicate that we would be looking at what we call the mechanistic aspects of the accidents and also tempering that with realism for the frequency with which those would be occurring.

So it would be our intent that for the

detailed test plans that there would be an indication of how we made our decision, and that would include the frequency of occurrence. So those numbers we plan to generate and have available at that time.

MR. CAMERON: Okay. Lisa?

MS. GUE: I think there's a very low probability that Bill and I will agree on the appropriate use of probabilistic analysis in this report.

I had 3 questions and then 2 comments.

First of all, I just note that there doesn't seem to be a discussion of a proposed temperature for this fire nor is there a specific invitation for comment on that point, although I can assume it's there, I suppose, even if we don't see it. But I guess, I mean on the one hand that perhaps it's an indication of openness when NRC staff doesn't come with a specific proposal. But on the other hand, if this is the last document that's available for public comment, it gives no idea of where the NRC is at on this and nothing to react to. So that's a bit of a problem.

And secondly, in terms of the sequencing of these tests. Again, I don't want to leave my earlier comment that I think more than just the temperature and impact testing is necessary in the sequence. But I was also wondering if there's any plan or if there's already been done analysis of what the most damaging would be? Whether the most damaging sequence is an impact and then a fire or if a fire damaged cask would be more damaged by an impact accident subsequently. That would be also useful information.

And my third question was about the animation that Chris played showing where the temperatures were hottest on the -- well inside the cask. And that showed the assemblies at the very top center of the cask seemed to be the hottest during that fire. But then I would expect that during the impact test that we discussed previously, that the most damaged parts of the cask might be on the end or for a back breaker test probably at the bottom.

So I guess this is just leading into a question about where is that surrogate assembly going to be placed and how appropriate is it to have only one surrogate assembly for those two different tests or what I hope will turn out to be more than 2 different tests? And I'm wondering if it would be more appropriate or more useful then to have the cask fully loaded with surrogate assemblies rather than just the one?

And then just for onto the two comments very briefly here. First of all, I think that the discussion between the different analysis that have been presented over the same event really serves to highlight the need for more physical comprehensive tests in addition to modeling. And I want to emphasize that from our perspective advocating physical testing as a condition for licensing is also with the greatest respect for the sophistication of the models that are employed, but knowing that models answer the questions that you remember to ask in the way that you ask them. And that's why we're convinced that physical testing does have a value in addition to these sophisticated models.

And finally, I think the assumptions about dedicated trains, and I'm very interested to see NEI's new transportation policy on that point as well, but it seems that it would be more responsible for the

NRC as the regulatory agency to incorporate into its regulations around nuclear waste transportation these assumptions that are being used rather than turning always to the industry groups to essentially hold the high bar for those regulations if that's what's needed to guarantee the kind of safety we're after. Again, we'd advocate that being incorporated into NRC's regulations.

MR. CAMERON: Okay. Thanks, Lisa. And I guess I would just put two questions out here.

One, can we say anything to Lisa about her question of the absence of a proposed temperature and what we would like people to tell us on that? And I guess on the last comment about the NRC taking lead on things such as the NEI, what's in the NEI policy. And I don't really know the answer to this, but I thought it might be worthwhile just seeing if we could find out. Is that the type of regulatory activity that's within our jurisdiction or is that a DOT and we can all point to Rick Boyle.

But could we go to the temperature question and then to the jurisdictional question? Who wants to do temperature? Andy. And then we'll go to

Bill on the jurisdictional.

DR. MURPHY: I'll do the temperature one, because that's the easiest one all day. We unfortunately fell into a trap of jargon. The hydrocarbon fire that basically burns at pretty much one temperature, 1475, yes, it is at a particular temperature.

Now Bill can have the difficult one.

MR. BRACH: The question about NRC regulation. To essentially incorporate a requirement for use of dedicated trains, Rick Boyle when we were going around earlier in introductions this morning, Rick Boyle from DOT identified that in the area of radioactive material transportation there are two agencies involved in this regard, and one is NRC and the other is DOT. And regulations of the railroads is an aspect of regulatory authority that is the responsibility of Department of Transportation.

And I believe Bob Fronczak as well as mentioned from American Association of Railroads the positions taken by AAR with regard to use of dedicated trains for the transport of spent fuel. And I've just earlier today as well from John Vincent from

NEI that NEI has offered a similar policy statement as well.

MR. CAMERON: And Lisa, your point is well taken about government taking initiative on there's no action in the industry, and you may not have been saying that. But I just wanted to make sure that people understood what the framework was.

Rick, do you want to add anything before we go to Abby?

MR. BOYLE: Thank you. Just for clarification. It is the Federal Railroad Administration would make the determination on dedicated train, the use of it or if you don't have to use it as well as the configuration of what the train would look like. And it's long overdue, so it's a little tongue in cheek. But they have a dedicated train study that's due to come out, I think it was supposed to be the end of last year, but it hasn't come out yet. They say it's in final editing. I believe that's going to be their position, something similar to what NEI said is this is what we believe should happen as far as dedicated train and spent fuel. So when that becomes available, I'll certainly share that with the NRC team that is putting this together.

MR. CAMERON: That's great. And I would note that we did have Claire Orth from the Federal Railroad Administration slated to come today, but she was unavoidably detained and had to miss the meeting, and she could have shed some light on that.

Let's go to Abby and then to Mark.

MS. JOHNSON: Rick, can DOT compel the Department of Energy to use dedicated trains?

MR. BOYLE: Yes. Federal Rail if they say spent fuel will move in dedicates in train, it will move in dedicated train.

MS. JOHNSON: That's new information. We've been asking the Department of Energy for several years to give us their thinking. We, just as a modest local government, on whether they're considering dedicated trains. And they kind of, you know, just shrug and they're not clear on it. So this is new information for me. This is very helpful.

But that's not what I was going to say.

MR. CAMERON: All right.

MS. JOHNSON: What I was going to say is, getting back of course to public confidence, page 70 has a statement that is the sort of thing that is to be avoided by a regulatory agency. "Because these tests will exceed the regulatory limits containment is not going to be verified after the fire tests."

Now, I know that makes sense to all of you, and I understand where you're going with this. But to the public that says oh, we're going to do the test. Containment is going to be breached and we don't get to know about it because that's bad information that you don't want us to know. You don't think we're mature enough to know to handle the information about when the container is breached. And so I just wanted to point out that that's the kind of thing that sets our teeth on edge and that's probably going to be edited out of the final document.

MR. CAMERON: Thank you, Abby.

Mark? And then we'll go to Bill and over to Bob.

Mark?

MR. HOLT: Just had a quick question. In reading the document it wasn't clear to me whether a fire test is supposed to be done on the same casks that that the impacted test were on.

DR. MURPHY: Yes, they will be done on the same -- that is our proposal to do the fire tests on the impacted casks.

MR. CAMERON: Bill and then go to Bob.

MR. SHERMAN: I just wanted to second Amy's comment about the containment not being breached. We had the same view that you did.

MR. CAMERON: And Abby.

MS. JOHNSON: So there is some connection between New England and Nevada after all.

MR. CAMERON: Bob, comment, question?

MR. HALSTEAD: First, I'm sorry, Rick, I missed your comment on dedicated trains. Could I just ask you to repeat that and I wanted to make an additional comment.

MR. BOYLE: Comment that Federal Rail is completing a study and it should be out shortly and we'll communicate it.

MR. CAMERON: That's one.

MR. BOYLE: Is that the one you missed or--

MR. HALSTEAD: That's the one I've been waiting for ten years, my friend, but it's well worth waiting for.

MR. BOYLE: That's maybe why Claire didn't show up today, because she knew you'd be waiting.

MR. HALSTEAD: Thanks.

I do want to say that I think it's real significant that NEI is taking this position when we see it, and it's certainly something that we've advocated for a long time. And I know there are many people in the department, both at DOT and DOE, who think it will happen but for some reason we haven't had a policy statement from DOE, where I think they could have taken an initiative, even though there isn't a regulatory imperative.

But that said, the other issue with fire testing that I wanted to address, the position of the cask in the test in the fire test. We're looking at the zero point 3 meters right now, but that's one of those details to be worked out. But another set of details to be worked out is the whole question of instrumentation.

And, again, I don't want to keep us here. I think the best way to handle this would be if we could deal with this as one of the really important issues that we didn't have time to deal with properly tonight and either in Nevada or in Chicago be prepared for a larger discussion of instrumentation, and particularly for the fire test but also for the impact.

Thank you.

MR. CAMERON: And I think that probably would be the Chicago meeting for many reasons. But that's a good suggestion that we perhaps focus in on some of these things that we don't get a chance to discuss at another meeting.

We have John and then Fred. John?

MR. VINCENT: Just a quick follow up on Bob's comment.

I think we heard this morning that we were going to get the chance to put our eyes on and comment about the actual test plans and the test procedures. And those will no doubt detail exactly what Bob is asking for.

MR. CAMERON: And let's make sure we know what's going on there so that there's no dashed expectation in the future. When we do have the detailed test plans and, Andy, correct me if I'm wrong on this, you said that they wouldn't be going out as a draft for comment, but welcome comments from people on that. Is that correct?

DR. MURPHY: That is correct.

MR. CAMERON: All right.

DR. MURPHY: It is not our plan at this time to publish them as we did with the test protocols, but ask for public comment. They'll be published, made available. If there are comments, send them in to us.

MR. CAMERON: Okay. And you know perhaps one other issue that we could have more discussion on, and this might be appropriate for Nevada that ties into this issue of looking at the detailed plans, is Fred had mentioned the model of continuing stakeholder involvement in the TRUPAK situation. And I don't think we're going to get a chance to discuss that today, but that might be something else.

Fred, if you want to say anything more with your comment here, go ahead.

MR. DILGER: Just very quickly. I agree with Bob Halstead's comment. One suggestion perhaps for next week's meetings might be to swap the fire and the drop test discussions to have the fire discussion first to get a little bit more dialogue about it next week.

MR. CAMERON: Okay. That's a great suggestion.

We have suggestions for Las Vegas and also for Chicago. And Kevin?

MR. KAMPS: Just quickly. Just given the hotter burning materials on the roads and rails, I would encourage that a much hotter temperature be considered than the hydrocarbon temperature.

MR. CAMERON: Okay. Andy?

DR. MURPHY: I got one comment to make for sure before we wrap up, and that there is very definitely one important question that apparently did not get into our list, and I would like for everybody to be thinking --

MR. CAMERON: And, Andy, could you talk into the mike, please?

DR. MURPHY: I'm sorry about that. One

other item that I think we are asking for additional comment on, and that is whether or not this should be a test to failure without at this moment defining what failure is. I think we've had considerable discussion today on that point. It was not a point that we had identified for comment, but I think very definitely at this stage it's got to be identified. We got to think about it. Comments would be appreciated.

MR. CAMERON: Anybody in the audience have a comment? Okay.

We have two comments out here. Felix? Felix Collar or however you pronounce it.

MR. COLLAR: Felix Collar.

I just wanted to make a comment, is that I'm actually on a working committee for ASTM standard. We're doing fire test type cask, as standard is close to finalization, I do think it's something you guys might want to take into consideration. And I'll make that available to you.

MR. CAMERON: Thank you, Felix.

All right. One comment over here. And please tell us who you are.

MR. LOPEZ: My name is Carlos Lopez.

From Sandia National Labs.

I just had a few comments, and I hope I forward them all quickly.

Regarding the performance of a cask inside the tunnel fire, I just did a paper for PATRAM 2001. It's title is "Analysis of the Effects of Pipeline on Railroad Fires on Legal Weight Truck Casks, Transportation Casks." Legal weight truck, transportation cask.

In this paper you will find at figure 15 of temperature history of a LWT type cask similar to the NAC-LWT when analyzed a fully engulfing 800 degrees fire. And you don't see internal wall temperatures exceeding 650 degrees C until 7 hours. So 650 degrees C should be a conservative temperature of the internal wall, that's assuming that there's a 100 degrees C temperature difference between the wall, inner wall of the cask and the center fuel beam. And that is considerably large. So I suppose that this 7 hours prediction is rather conservative. That goes along with what Chris said before that there was only enough fuel in that Baltimore tunnel fire to burn for about 7 hours. Therefore, even a truck cask is smaller and will heat up a lot faster than a rail cask will, will have survived such an environment.

And this is a fully engulfing, again, 10-CFR fire without impact limiters, which is not what I think a cask will have experienced inside this tunnel due to the temperature differences all the way from the bottom to the top of the tunnel. The oxygen starvation will have made that flames quite a bit cooler, combustion will be considered. In fact, looking at the figures or pictures of the smoke coming out very black, it's a very good indication of very poor combustion going on.

And I just wanted to mention that on temperatures. So even a truck cask will have survived that environment in my opinion, and that's similar to what Chris was saying, he was talking about 37 hours for a rail cask, a truck cask we're talking over 7 hours. So I think we're fine there.

The other thing is on the probability of fires, the same as part of a similar or same report that we wrote inside Sandia, it was never published but we actually published another paper in PATRAM 2001, too. This is by Dr. German Kovsky now retired.

He did the probability part of this study.

He has a section in this paper where he -- I suppose it's in the paper, too. If not, it's in the draft report. I can make a copy available after we publish this at Sandia. That shows that probabilities of a fire or a cask being involved in a fire in a train accident is in the order 3 tens to the minus 7, just to give a flavor for probabilities.

One more thing is fire temperatures. You cannot really play much with fire temperatures when you do an open environment fire which will burn, in my opinion, more efficiently than it will in a tunnel fire. Therefore, comments that have been made before during the day stating that the tunnel fire, it's probably that one percent that the regulations don't encompass, it's my opinion not true. I think that if you want a worse case scenario, you want an open booth fire with engulfing optical events.

To explain a little bit on the optical events item. If the cask cannot see the environment, it cannot lose heat to the environment. And that is what that's all about. It's inside this plain and it cannot see environment, it can only receive heat, not give any heat.

I think that's all I have for now. I would love to talk about the instrumentation issues, but I think that is for another meeting. So thank you very much.

MR. CAMERON: Thank you. And if people want to see a copy of those PATRAM papers they could talk to you and perhaps get a copy. Good.

Oh, God, I hate to say this but --

MR. HALSTEAD: Could we ask that those papers be added to the materials on the website.

MR. CAMERON: Great. Good. We'll look into that.

MR. HALSTEAD: Yes, but I forgot about the damn copyright issues. So, of course --

MR. CAMERON: We're ready to close now. And I just want to thank all of you for your intensiveness and preparation, and also for following the ground rules, too.

And I just want to ask are there any other burning issues? I'm sorry for that bad pun.

MR. HALSTEAD: I'm sorry, are you leaving fire and going to your close out discussion? Or is this your close out?

MR. DILGER: Yes. This is it. This is it.

MR. HALSTEAD: All right. Let's talk about one issue that we didn't really talk about, and we're not going to talk about it tonight, but you need to think about talking about it in Chicago.

And that's the issue of the deep immersion test because of the proposal that DOE made in the final EIS for considerably large numbers of barge shipments, including the potential for a fairly large number of barge shipments on Lake Michigan where there are in fact cannons that are deeper than the 200 meter depth that's reflected in the IAEA standard for the deep immersion tests.

And, you know, certainly we've raised it in the past. I honestly don't know how it should be folded into this large discussion. But I think it would be well for you to come to Chicago prepared, at the very least to talk about how cask licensees typically comply with the deep immersion test as part of the certification process and what the alternatives are there.

And the other thing I want to say is on

public participation generally, I really appreciate the way that this has started. The good news for NRC is that the Turkish parliament apparently has not requested a role in approving these test protocols and related documents, but the bad news is that your stakeholders now do expect a large role. And indeed, Ken and Andy, I think you're going to have to expand your thinking about the public role and maybe be thinking already about a public meeting on your detailed test plans. I don't know if this is to end in this fiscal year exactly, how you've scheduled this. But I think that would be a good thing to think about.

And I said before, I personally appreciate the way that this portion of the NRC's interaction with the public has been carried out. And I would very much like it. I'm not expecting much yet, but it would be so nice if this were the way we normally dealt with one another instead of the way that we have dealt with each other over many issues, not only in the past but unfortunately inthe recent past.

Thank you very much.

MR. CAMERON: Very helpful, Bob. Thank you.

And let's see if anybody else has any final comments. And I want to ask Bill Brach to close the meeting for us when we get there as our senior manager.

Anybody else have anything they want to say on the record before we close?

And we thank you for suggestions about the agendas for the future meetings that we're going to do. Because that's helpful.

Abby Johnson.

MS. JOHNSON: I have two comments. One is that probably because of the late start that we got today due to the security stuff, we probably didn't have as thorough a discussion of the overarching issues as we probably should have.

But my other comment is that, Chip, I really echo what some of the other people said about future meetings. That you may want to look at shaking this agenda up a bit and moving things around to make it a little less dense for depending on what meeting you're structuring it for.

I'm just saying, you know, just because you have this thing typed up for here and for Illinois, it's not fixed in stone.

MR. CAMERON: Yes, we have it on the word processor. We do have those.

MS. JOHNSON: Because I think maybe if you play with it a little bit, I agree with moving the fire stuff up.

MR. CAMERON: Yes. We'll move the fire stuff up and perhaps is there an indication that maybe for some of the other meetings we don't need to get as technically deep on things or --

MS. JOHNSON: I'm not sure. I'm not sure. I think each one is going to be very different. And so I think in Nevada you're going to have the usual suspects. And their interests are going to be different and in general what they want to say is going to be different than what a lot of people at this table want to say.

MR. CAMERON: We might anticipate in Nevada that perhaps overarching issues might be given more attention and process, public participation.

MS. JOHNSON: I would think so. I would

sort of defer to my Nevada colleagues here to see what they think. But, I don't know.

MR. DILGER: I would just say that I think that the audience in Las Vegas will be very interested in hearing a clear expression of whatNRC's testing strategy is and what they hope to get out of the testing. What they really want to accomplish.

MS. JOHNSON: I would agree.

MR. DILGER: Just to give the context for these other more detailed technical questions.

MR. CAMERON: Okay. That's very helpful.

Anybody else?

Okay. Well, I have to thank you. Great. Ask Bill to close the meeting up.

MR. BRACH: Thank you, Chip.

It's clearly been from my perspective a long but a very, very productive day.

One advantage of sitting this way, I've been watching as the audience has been dwindling, and (1) I want to thank those in the audience that has persevered and are still here. But really, most importantly, I want to thank all the members on the panel. The dialogue we've had, I think, was most productive.

IF we go back to the slide in my opening discussion, and I think it was the last slide I used, I said what do I see as a success for today's meeting and I made reference to dialogue, expression of views, comments, suggestions. And clearly from my perspective and listening, and I think on all the parts of NRC and our NRC contractors has been very productive.

The dialogue that's has exchanged and flowed across and around the table, expression of view points. Many of those viewpoints not necessarily in sync. Some were representing different spectrums of views. But that's the purpose of the workshop is to have the opportunity for and to put those comments on the table for consideration both for us as well as you on the panel. And I appreciate and thank you, thank you very much for that.

The suggestions for the meetings coming up in Las Vegas adn Pahrump and Chicago in the next two weeks are one, very much appreciated and we will take those into consideration as we're looking at revamping to the extent that we can, some of the schedules for those activities. And as Chip had said, it's on the word processor. So it's similar to the comments I mentioned this morning when I think Bob Halstead asked me, on behalf of NRC, are we locked in on decisions with regard to the draft test protocols. And the answer is clearly no. And the same goes for, with regard to the agenda for the next two weeks. Those agendas are flexible and we'll attempt to fashion them to meet and provide for as much input and opportunity for input as we can.

So with this I realize that it's getting late. And on behalf of NRC, I would like to thank all of you all for your attendance here, your participation and your support and your input. And thank you and look forward to additional productive dialogues in future meetings as well, as you take the opportunity to provide additional comments to us between now and the May 30 time frame. Thank you very much.

(Whereupon, the above-entitled matter was concluded at 5:50 p.m.)